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Android Platform Development with Linaro

One-stop shop debugging...

Next-Generation Android India 2012
The Lalit Ashok, Bangalore, India

Zach Pfeffer
Linaro Android Platform Lead

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zach.pfeffer@linaro.org

A Quick Introduction to Linaro

A Quick Introduction to Linaro
Using Linaro's Android Platform
  Get and Use a Premade Build
  Build and Use the Platform from Source
  Debug with GDB
  Debugging the Kernel
    Rebuild the Kernel
    Change the Kernel's Config
  Debugging the Kernel and User Space at the Same Time
  Native Debugging with ARM's DS-5 Community Edition
G1 Bring Up

What is Linaro?

A nonprofit engineering organization that improves open source software for the ARM architecture.

What does Linaro do?

Maintain “upstream focused” ARM platforms, like Android

Improve the Linux kernel's support of the ARM

Improve multimedia, graphics, power and the toolchain software for ARM

And other stuff... take a look at http://www.linaro.org

Why was Linaro Founded?

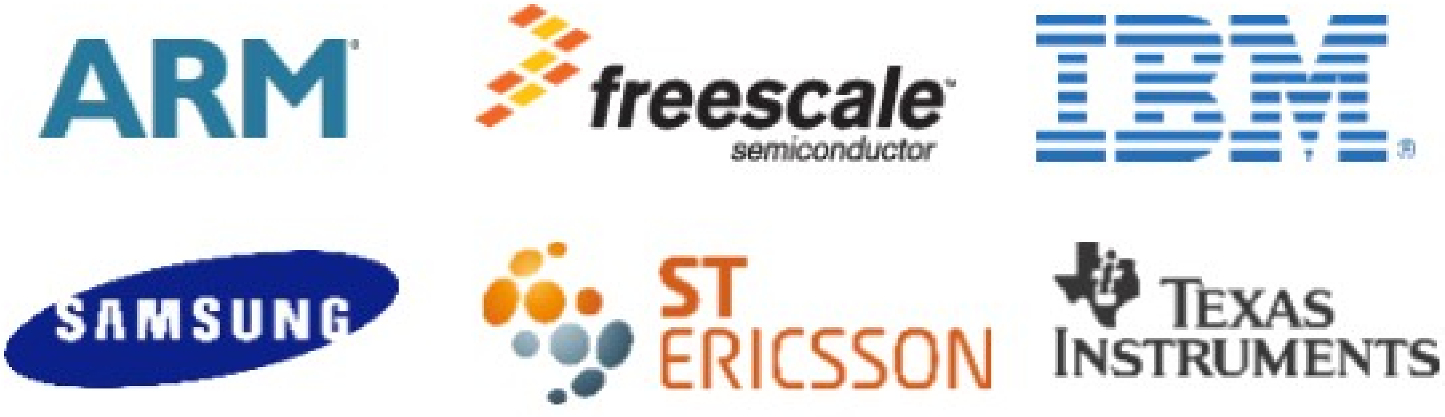
To lead open source software development on ARM

To help members deliver high quality OSS-based products to market as quickly as possible

To solve common problems and enable members to focus their resources on differentiation

Hehe, and to keep Linus from kicking
ARM out of the kernel ;)

Linaro Members



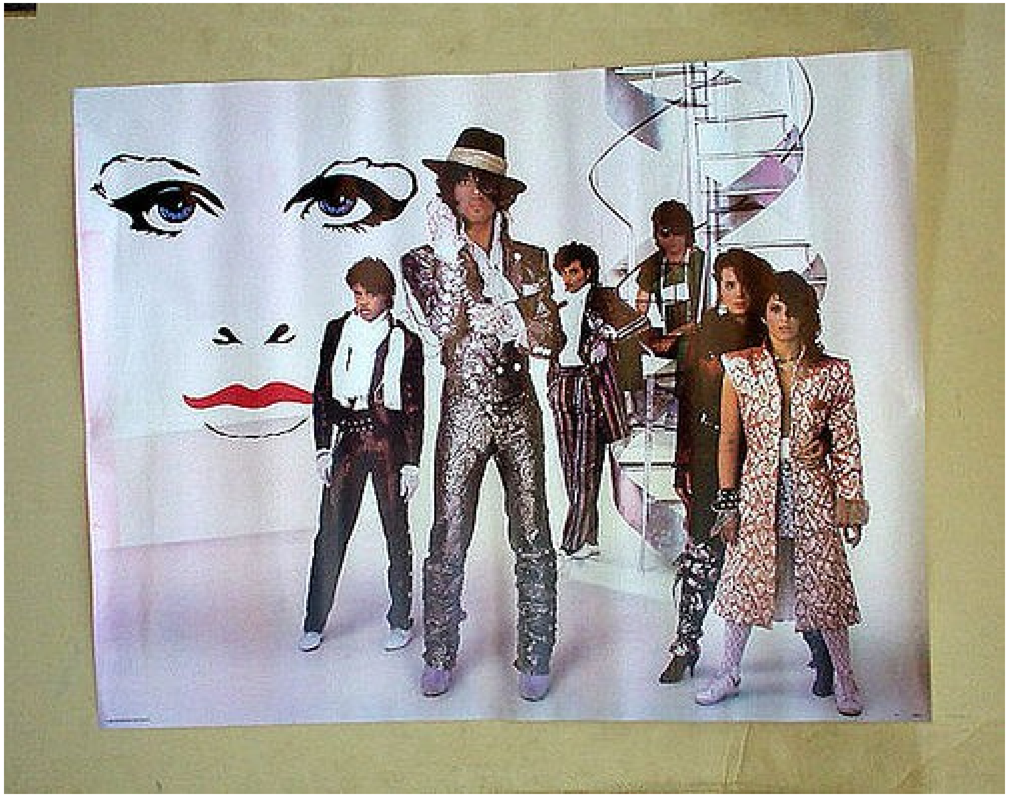
The people who boss us around...

Linaro Partners

Adeneo Embedded
Collabora
genesi
CANONICAL
Mentor Graphics
ThunderSoft

These guys work with us...

Join the Revolution



Prince and the Revolution ;)

Get Hooked In

Hang out on #linaro-android on irc.freenode.net

Join and send email to linaro-android@lists.linaro.org

Get a tip build at https://android-build.linaro.org/

Explore linaro.org

Using Linaro's Android Platform

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Get and Use a Premade Build

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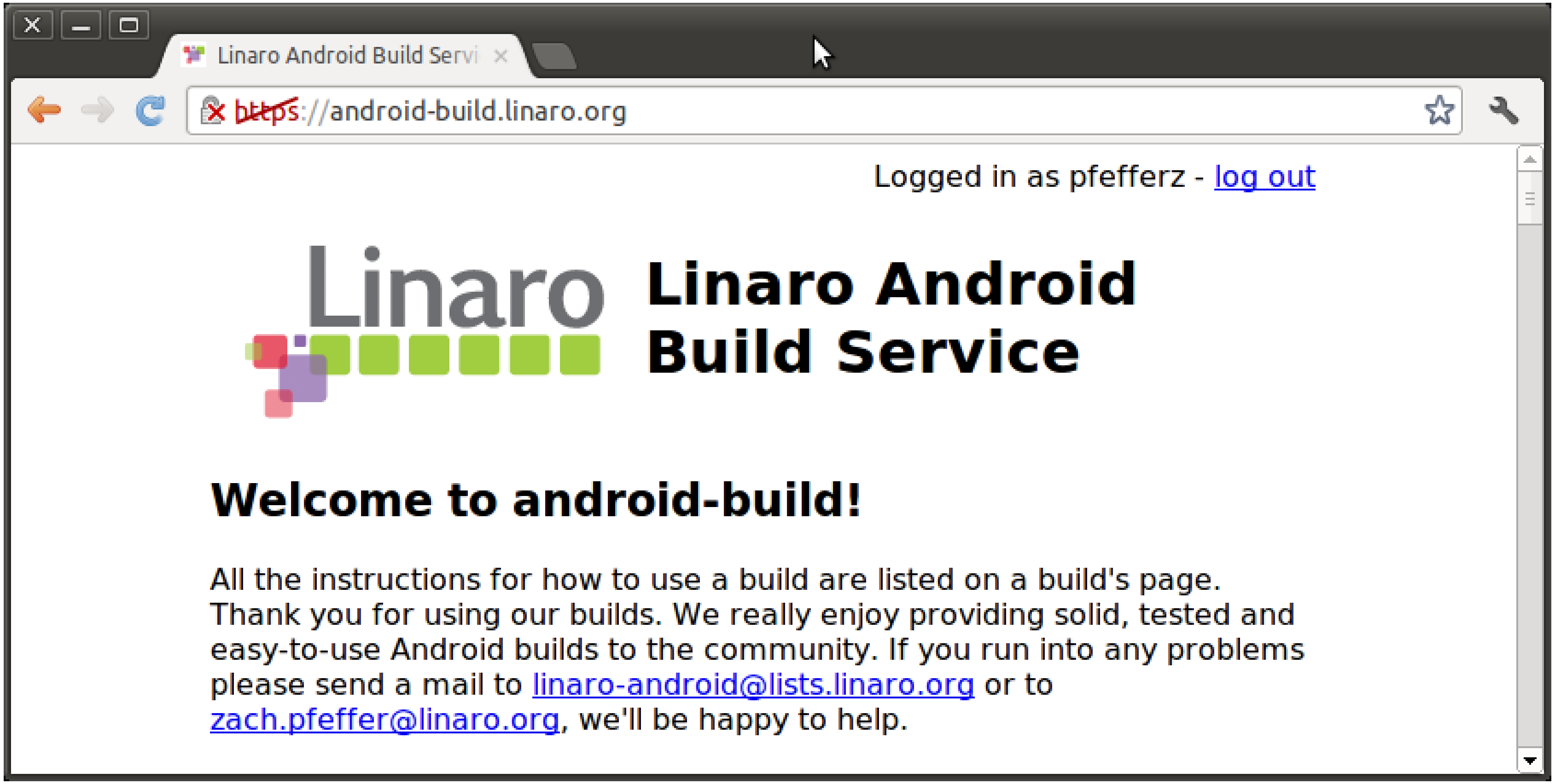
Linaro's Android Build Site



Linaro Android Build Servi
~~https~~://android-build.linaro.org

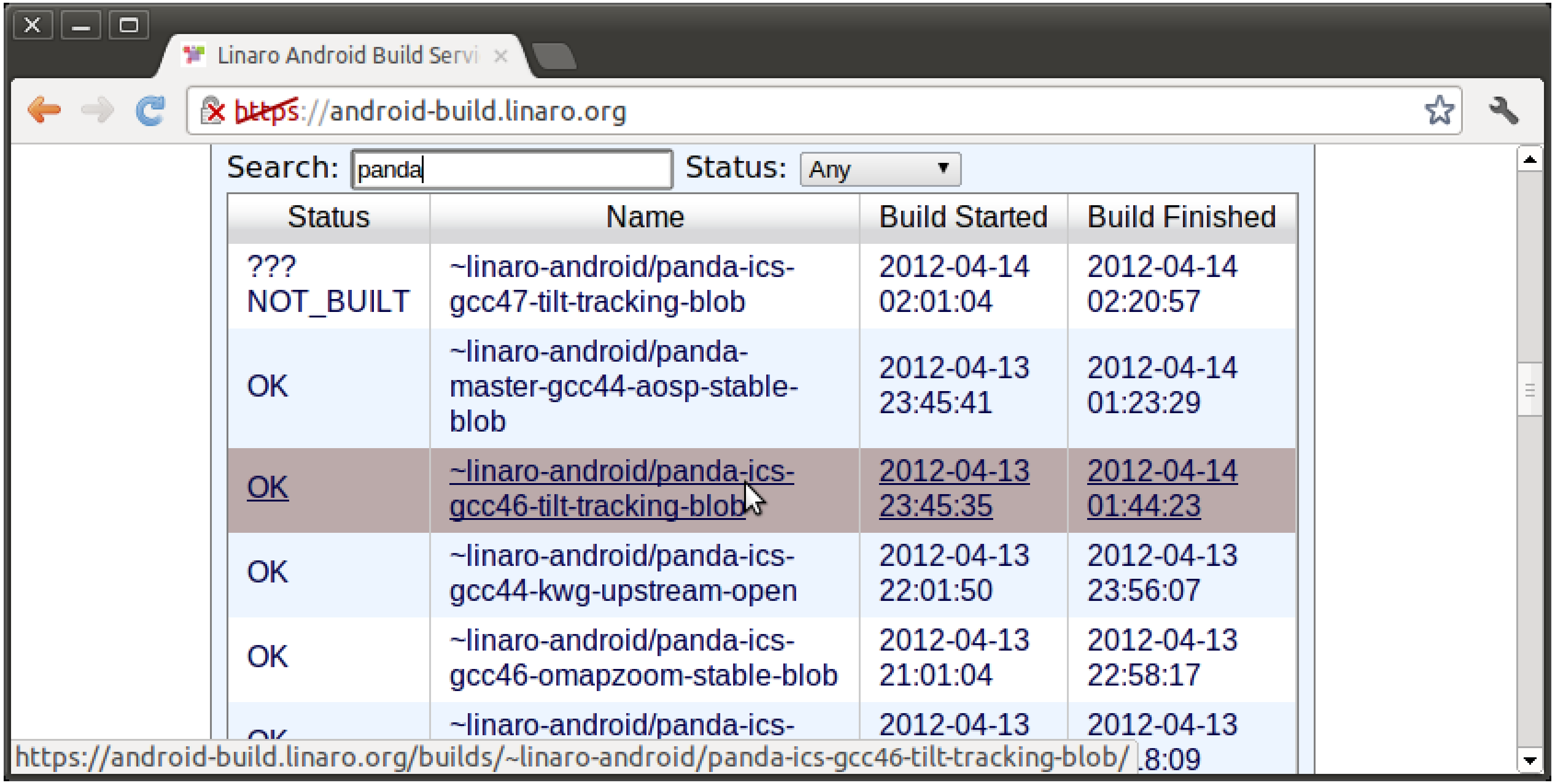
Logged in as pfefferz - log out

Linaro Android Build Service

Welcome to android-build!

All the instructions for how to use a build are listed on a build's page. Thank you for using our builds. We really enjoy providing solid, tested and easy-to-use Android builds to the community. If you run into any problems please send a mail to linaro-android@lists.linaro.org or to zach.pfeffer@linaro.org, we'll be happy to help.

Find a Build



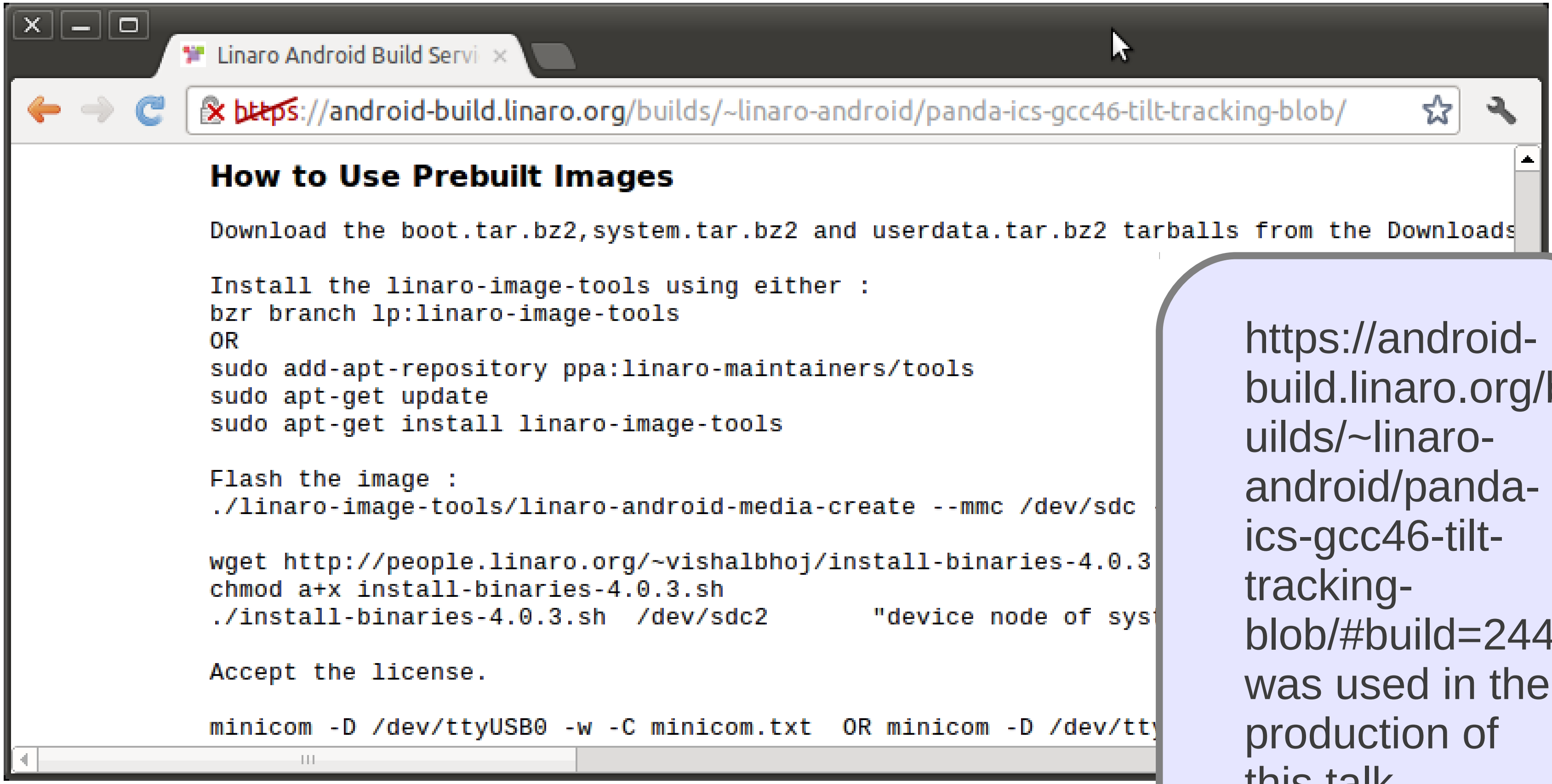
Search: panda Status: Any

Status	Name	Build Started	Build Finished
??? NOT_BUILT	~linaro-android/panda-ics-gcc47-tilt-tracking-blob	2012-04-14 02:01:04	2012-04-14 02:20:57
OK	~linaro-android/panda-master-gcc44-aosp-stable-blob	2012-04-13 23:45:41	2012-04-14 01:23:29
OK	~linaro-android/panda-ics-gcc46-tilt-tracking-blob	2012-04-13 23:45:35	2012-04-14 01:44:23
OK	~linaro-android/panda-ics-gcc44-kwg-upstream-open	2012-04-13 22:01:50	2012-04-13 23:56:07
OK	~linaro-android/panda-ics-gcc46-omapzoom-stable-blob	2012-04-13 21:01:04	2012-04-13 22:58:17
OK	~linaro-android/panda-ics-	2012-04-13	2012-04-13 .8:09

https://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/

Wow, that's a lot of builds, how can I find what I need?

Follow the “Prebuilt” Instructions



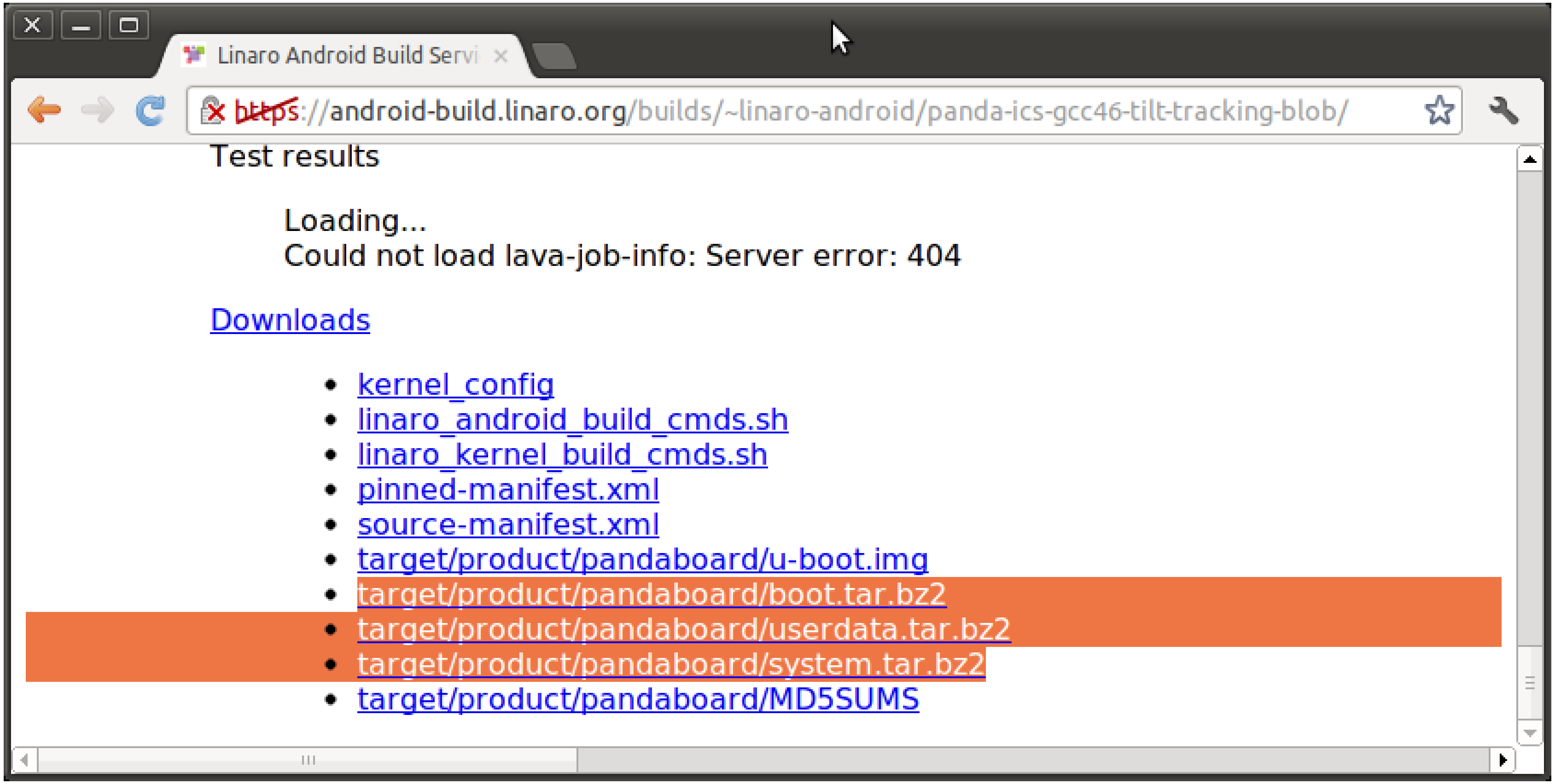
Linaro Android Build Servi
~~https~~://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/

How to Use Prebuilt Images

```
Download the boot.tar.bz2,system.tar.bz2 and userdata.tar.bz2 tarballs from the Downloads

Install the linaro-image-tools using either :
bzr branch lp:linaro-image-tools
OR
sudo add-apt-repository ppa:linaro-maintainers/tools
sudo apt-get update
sudo apt-get install linaro-image-tools

Flash the image :
./linaro-image-tools/linaro-android-media-create --mmc /dev/sdc

wget http://people.linaro.org/~vishalbhoj/install-binaries-4.0.3
chmod a+x install-binaries-4.0.3.sh
./install-binaries-4.0.3.sh  /dev/sdc2       "device node of syst

Accept the license.

minicom -D /dev/ttyUSB0 -w -C minicom.txt  OR minicom -D /dev/tty
```

https://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/#build=244 was used in the production of this talk

Save Images to Computer


Linaro Android Build Servi
~~https~~://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/

Test results

Loading...
Could not load lava-job-info: Server error: 404

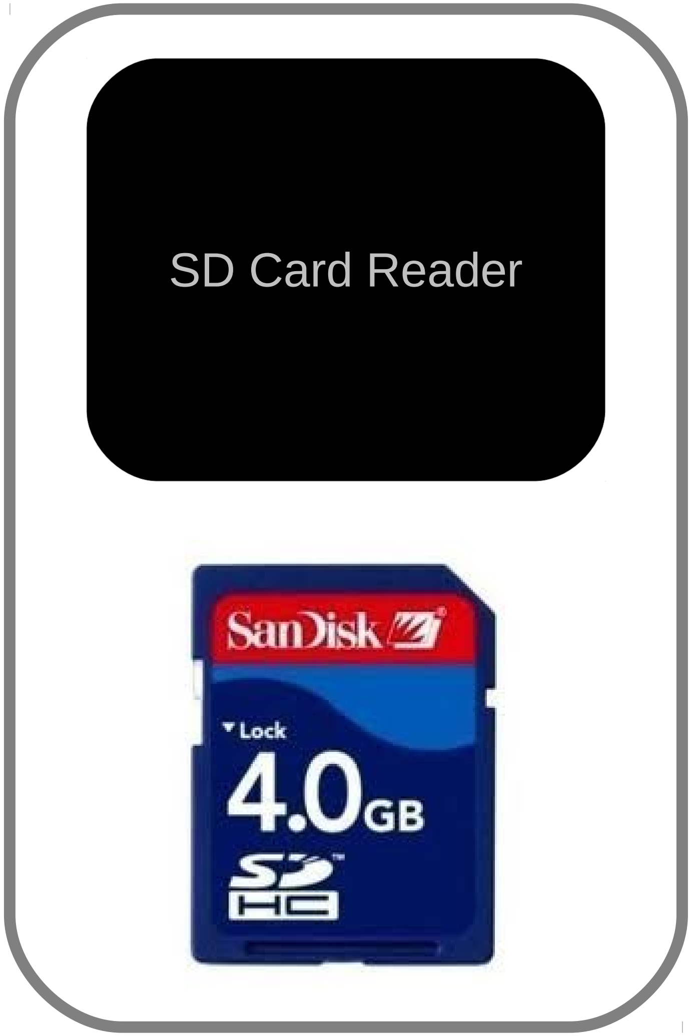
Downloads

- kernel_config
- linaro_android_build_cmds.sh
- linaro_kernel_build_cmds.sh
- pinned-manifest.xml
- source-manifest.xml
- target/product/pandaboard/u-boot.img
- target/product/pandaboard/boot.tar.bz2
- target/product/pandaboard/userdata.tar.bz2
- target/product/pandaboard/system.tar.bz2
- target/product/pandaboard/MD5SUMS

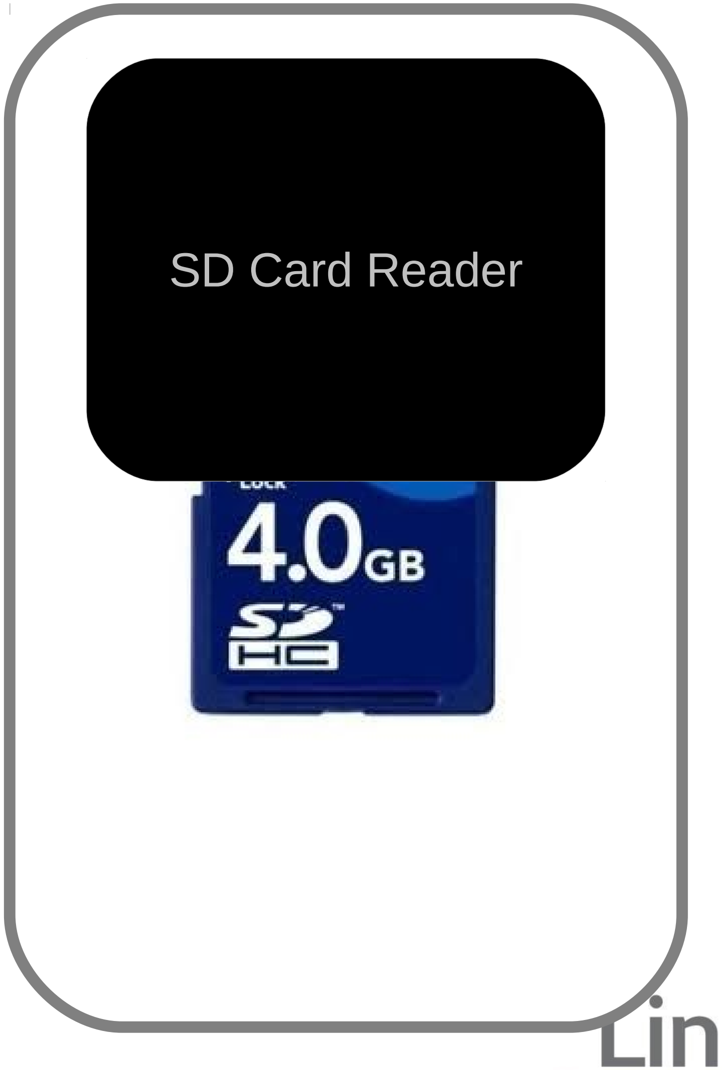
Get Programming Tools

```
sudo apt-get install bzr

sudo add-apt-repository ppa:linaro-maintainers/tools
sudo apt-get update
sudo apt-get install linaro-image-tools
```

Plug an SD Card In

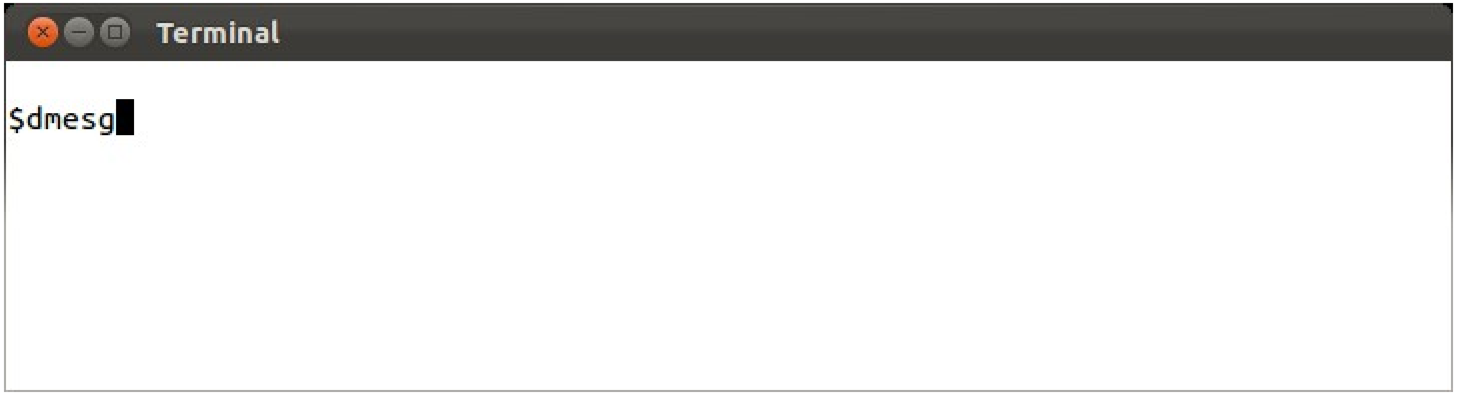


SD Card Reader

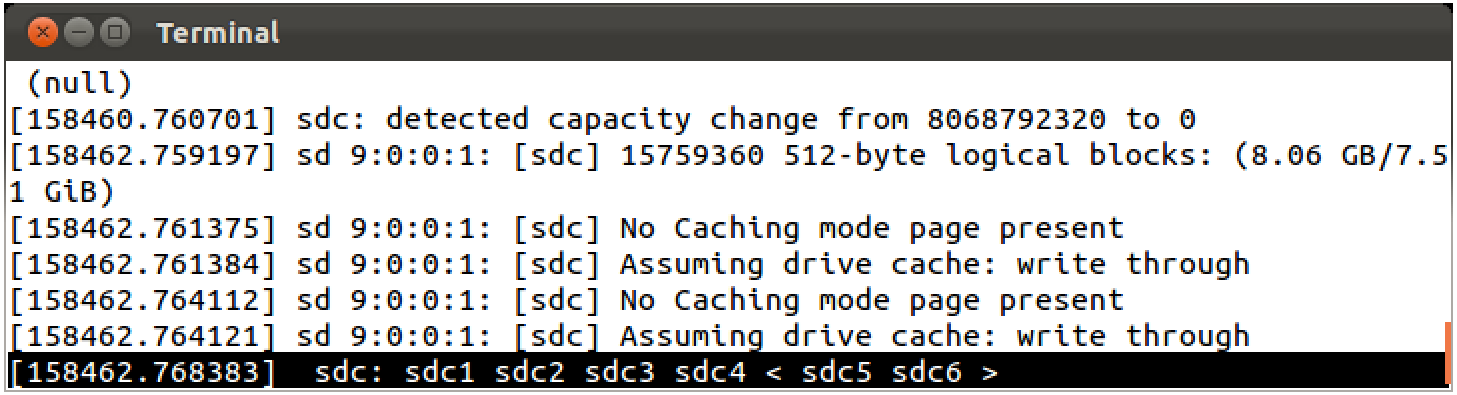


SD Card Reader

Find Device Node



```
$dmesg
```



```
 (null)
[158460.760701] sdc: detected capacity change from 8068792320 to 0
[158462.759197] sd 9:0:0:1: [sdc] 15759360 512-byte logical blocks: (8.06 GB/7.5
1 GiB)
[158462.761375] sd 9:0:0:1: [sdc] No Caching mode page present
[158462.761384] sd 9:0:0:1: [sdc] Assuming drive cache: write through
[158462.764112] sd 9:0:0:1: [sdc] No Caching mode page present
[158462.764121] sd 9:0:0:1: [sdc] Assuming drive cache: write through
[158462.768383]  sdc: sdc1 sdc2 sdc3 sdc4 < sdc5 sdc6 >
```

This line may look a little different

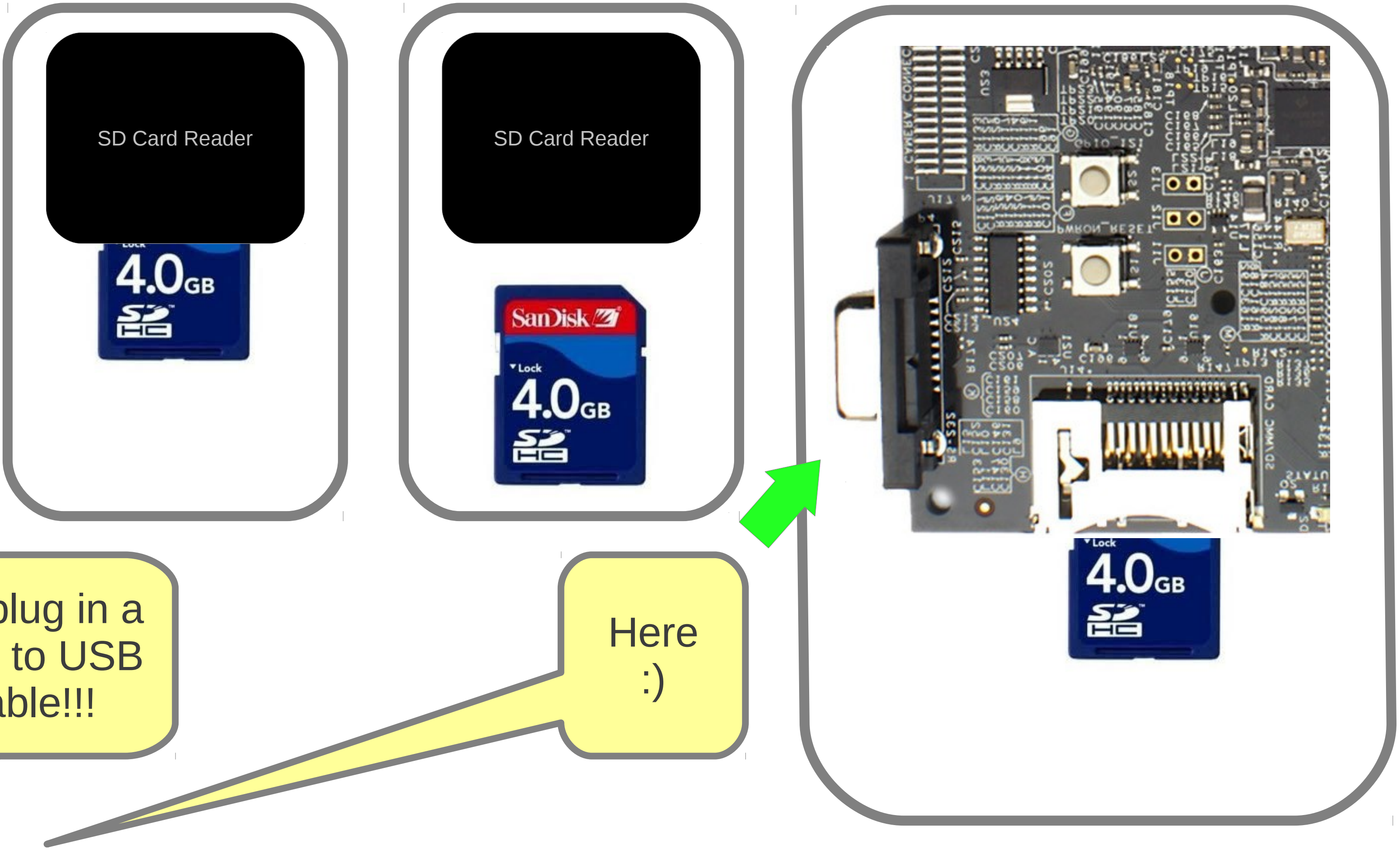
Program the Images

```
bzr branch lp:linaro-image-tools

./linaro-image-tools/linaro-android-media-create \
--mmc /dev/sdc \
--dev panda \
--system system.tar.bz2 \
--userdata userdata.tar.bz2 \
--boot boot.tar.bz2
```

Program the Graphics Binaries

```
wget http://people.linaro.org/~vishalbhoj/install-binaries-4.0.3.sh

chmod a+x install-binaries-4.0.3.sh

./install-binaries-4.0.3.sh  /dev/sdc2
```

Plug the SD Card Into the Target



Here :)

Also plug in a Serial to USB Cable!!!

Start Up a Terminal

```
minicom -D /dev/ttyUSB0 -w -C minicom.txt
```

Build and Use the Platform from Source

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You'll Need Some Tools

```
sudo apt-get \
zip               curl            flex                 bison \
build-essential   git-core        gnupg                gperf \
zlib1g-dev        libx11-dev      x11proto-core-dev    gcc-multilib \
g++-multilib      libc6-dev-i386  ia32-libs lib32z-dev gcc-4.5 \
g++-4.5           cpp-4.5         gcc-4.5-multilib     g++-4.5-multilib \
uboot-mkimage     uuid-dev        openjdk-6-jdk        ant \
lib32ncurses5-dev
```

Get the Code

Browse to:
https://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/#build=244

```
export MANIFEST_REPO=git://android.git.linaro.org/platform/manifest.git
export MANIFEST_BRANCH=linaro_android_4.0.4
export MANIFEST_FILENAME=tracking-panda.xml


curl "http://android.git.linaro.org/gitweb?
p=tools/repo.git;a=blob_plain;f=repo;hb=refs/heads/stable" > repo

chmod +x repo

./repo init \
-u ${MANIFEST_REPO} \
-b ${MANIFEST_BRANCH} \
-m ${MANIFEST_FILENAME} \
--repo-url=git://android.git.linaro.org/tools/repo.git

./repo sync
```

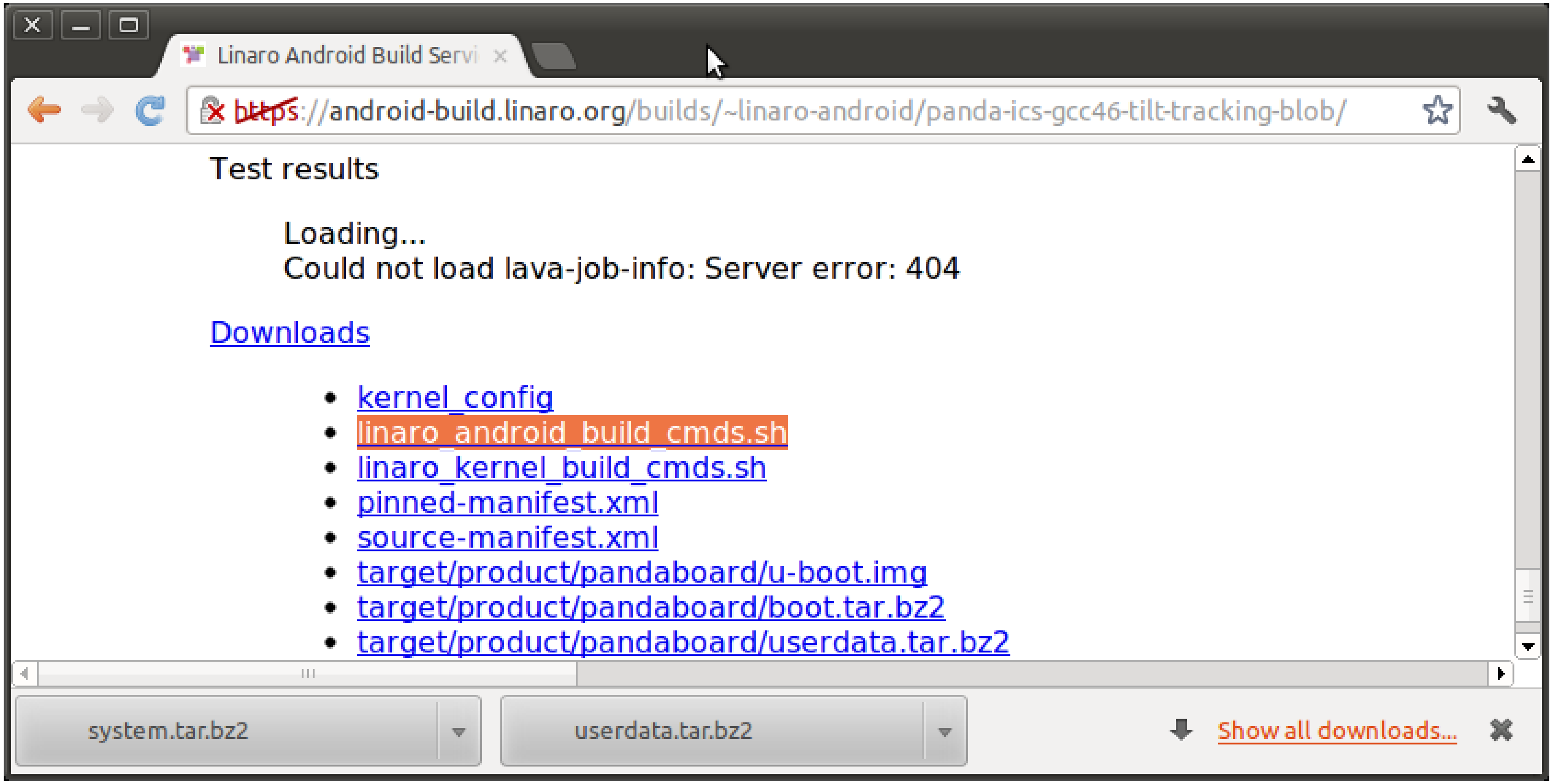
Get the Tools

```
export TOOLCHAIN_URL=http://android-build.linaro.org/download/linaro-
android_toolchain-4.6-bzr/lastSuccessful/archive/build/out/android-
toolchain-eabi-4.6-daily-linux-x86.tar.bz2

curl -k ${TOOLCHAIN_URL} > toolchain.tar.bz2

tar -jxf toolchain.tar.bz2

sudo add-apt-repository ppa:linaro-maintainers/tools
sudo apt-get update
sudo apt-get install linaro-image-tools

bzr branch lp:linaro-image-tools
```

Rebuild, Program SD Card, Log

```
export TARGET_PRODUCT=pandaboard
export TARGET_TOOLS_PREFIX=\
android-toolchain-eabi/bin/arm-linux-androideabi-

make HOST_CC=gcc-4.5 HOST_CXX=g++-4.5 HOST_CPP=cpp-4.5 \
showcommands boottarball systemtarball userdatatarball

./linaro-image-tools/linaro-android-media-create \
--mmc /dev/sdc \
--dev panda \
--system out/target/product/pandaboard/system.tar.bz2 \
--userdata out/target/product/pandaboard/userdata.tar.bz2 \
--boot out/target/product/pandaboard/boot.tar.bz2

wget http://people.linaro.org/~vishalbhoj/install-binaries-4.0.3.sh
chmod a+x install-binaries-4.0.3.sh
./install-binaries-4.0.3.sh /dev/sdc2

minicom -D /dev/ttyUSB0 -w -C minicom.txt
```

The Easy Way



Linaro Android Build Servi
~~https~~://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/

Test results

Loading...
Could not load lava-job-info: Server error: 404

Downloads

- kernel_config
- linaro_android_build_cmds.sh
- linaro_kernel_build_cmds.sh
- pinned-manifest.xml
- source-manifest.xml
- target/product/pandaboard/u-boot.img
- target/product/pandaboard/boot.tar.bz2
- target/product/pandaboard/userdata.tar.bz2

system.tar.bz2
userdata.tar.bz2
Show all downloads...

Save, Run, Hack

```
chmod a+x linaro_android_build_cmds.sh

./linaro_android_build_cmds.sh

./linaro-image-tools/linaro-android-media-create \
--mmc /dev/sdc \
--dev panda \
--system out/target/product/pandaboard/system.tar.bz2 \
--userdata out/target/product/pandaboard/userdata.tar.bz2 \
--boot out/target/product/pandaboard/boot.tar.bz2

./install-binaries-4.0.3.sh /dev/sdc2
```

Debug with GDB

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Tools

```
sudo apt-get install gdb-multiarch
```

A Small Example

external/gdbdemo/Android.mk

```
LOCAL_PATH := $(call my-dir)

include $(CLEAR_VARS)

LOCAL_SRC_FILES := demo.c

LOCAL_MODULE_TAGS := optional

LOCAL_MODULE := gdbdemo
LOCAL_CFLAGS += -g -O0
LOCAL_SYSTEM_SHARED_LIBRARIES := libcutils liblog libc

include $(BUILD_EXECUTABLE)
```

A Small Example

external/gdbdemo/demo.c

```
#include <cutils/log.h>

int loop = 1;

int main(int argc, char *argv[])
{
        while(loop)
                sleep(1);

        LOGE("Exiting!!!");

        exit(0);
}
```

Build, Upload and Run

```
cd android

make HOST_CC=gcc-4.5 HOST_CXX=g++-4.5 HOST_CPP=cpp-4.5 \
showcommands gdbdemo

adb remount

adb push \
out/target/product/pandaboard/system/bin/gdbdemo \
/system/bin/gdbdemo

adb shell gdbdemo
```

Find the pid of gdbdemo

```
$adb shell ps | grep gdbdemo

root      1906  1904  892    272    c0064c80 400a5734 S gdbdemo
```

Setup Port Forwarding

```
adb forward tcp:5039 tcp:5039
```

This says:
Forward the local TCP socket on port 5039
to the remote TCP socket on port 5039

https://github.com/keesj/gomo/wiki/AndroidGdbDebugging

Start the gdbserver

```
adb shell gdbserver :5039 --attach 1906
```

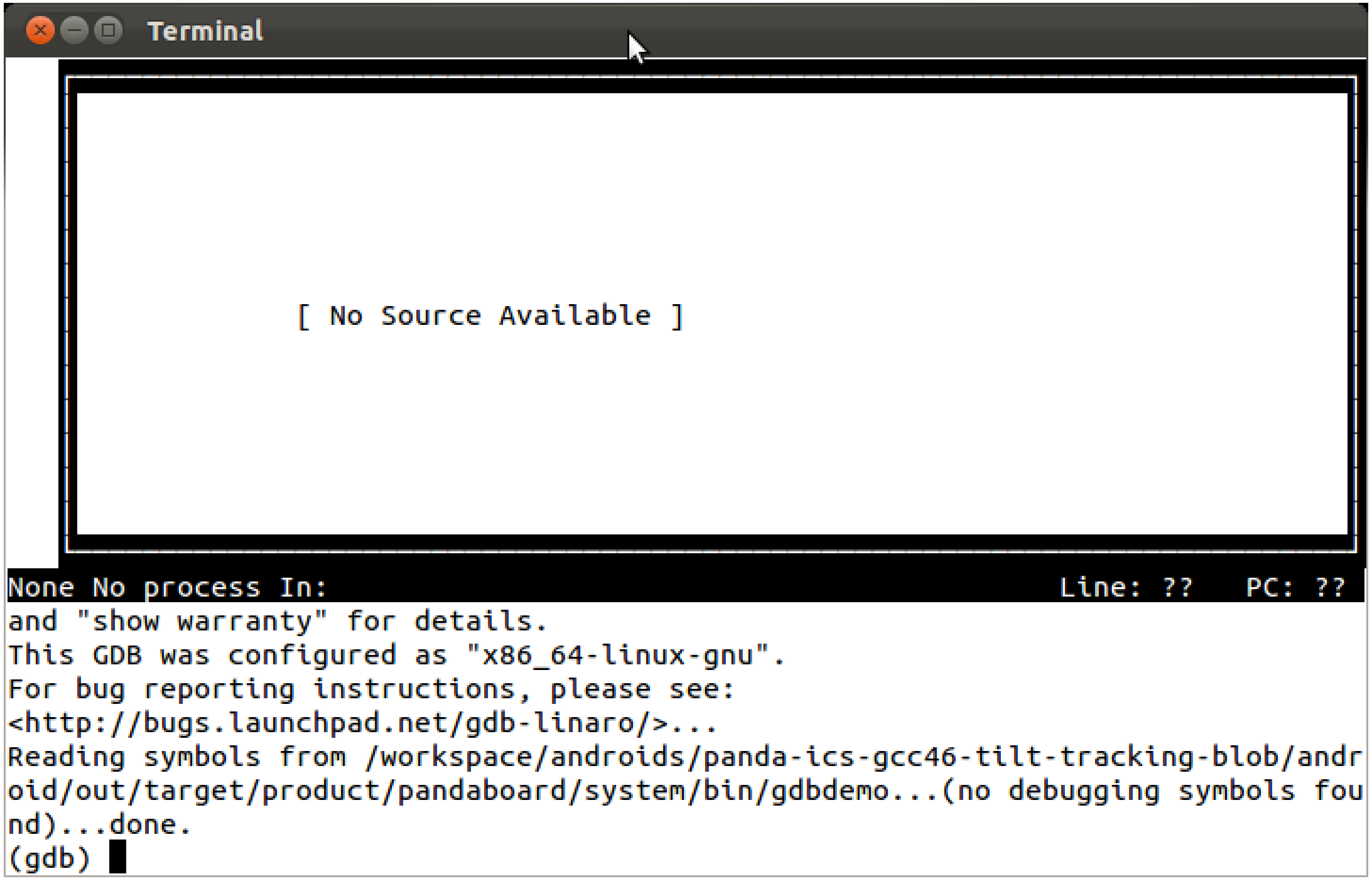
This says:
Start a gdb server listening on port 5039
and attach it to pid 1906 (gdbdemo)

Start the gdb client

```
cd android

gdb-multiarch --tui out/target/product/pandaboard/system/bin/gdbdemo
```

--tui
Use a terminal user interface

Start the gdb client

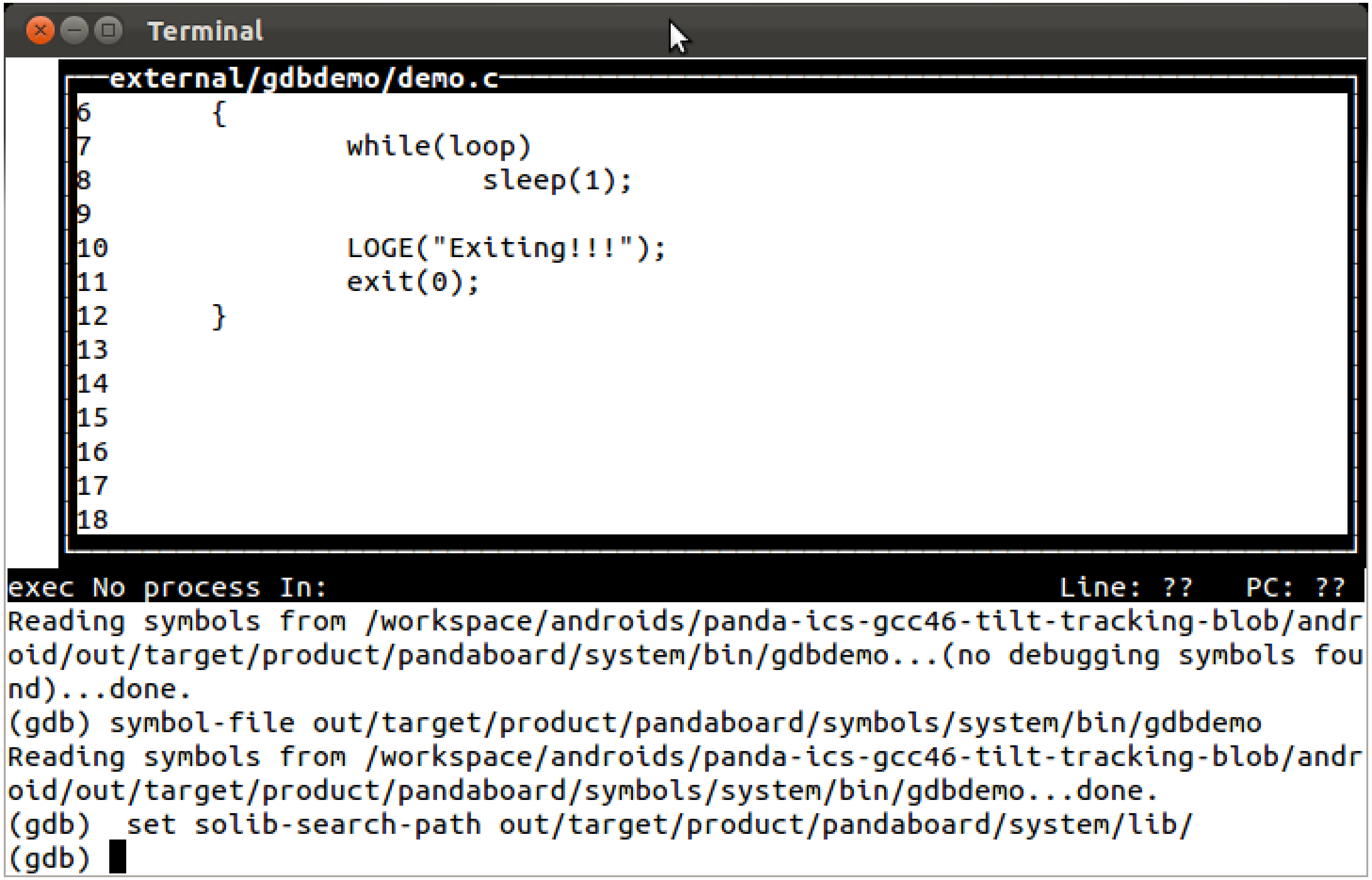


```
                    [ No Source Available ]

None No process In:                                         Line: ??     PC: ??
and "show warranty" for details.
This GDB was configured as "x86_64-linux-gnu".
For bug reporting instructions, please see:
<http://bugs.launchpad.net/gdb-linaro/>...
Reading symbols from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/andr
oid/out/target/product/pandaboard/system/bin/gdbdemo...(no debugging symbols fou
nd)...done.
(gdb)
```

Load Symbols and Code

```
(gdb) symbol-file
out/target/product/pandaboard/symbols/system/bin/gdbdemo

(gdb) set solib-search-path out/target/product/pandaboard/system/lib/
```

Load Symbols and Code



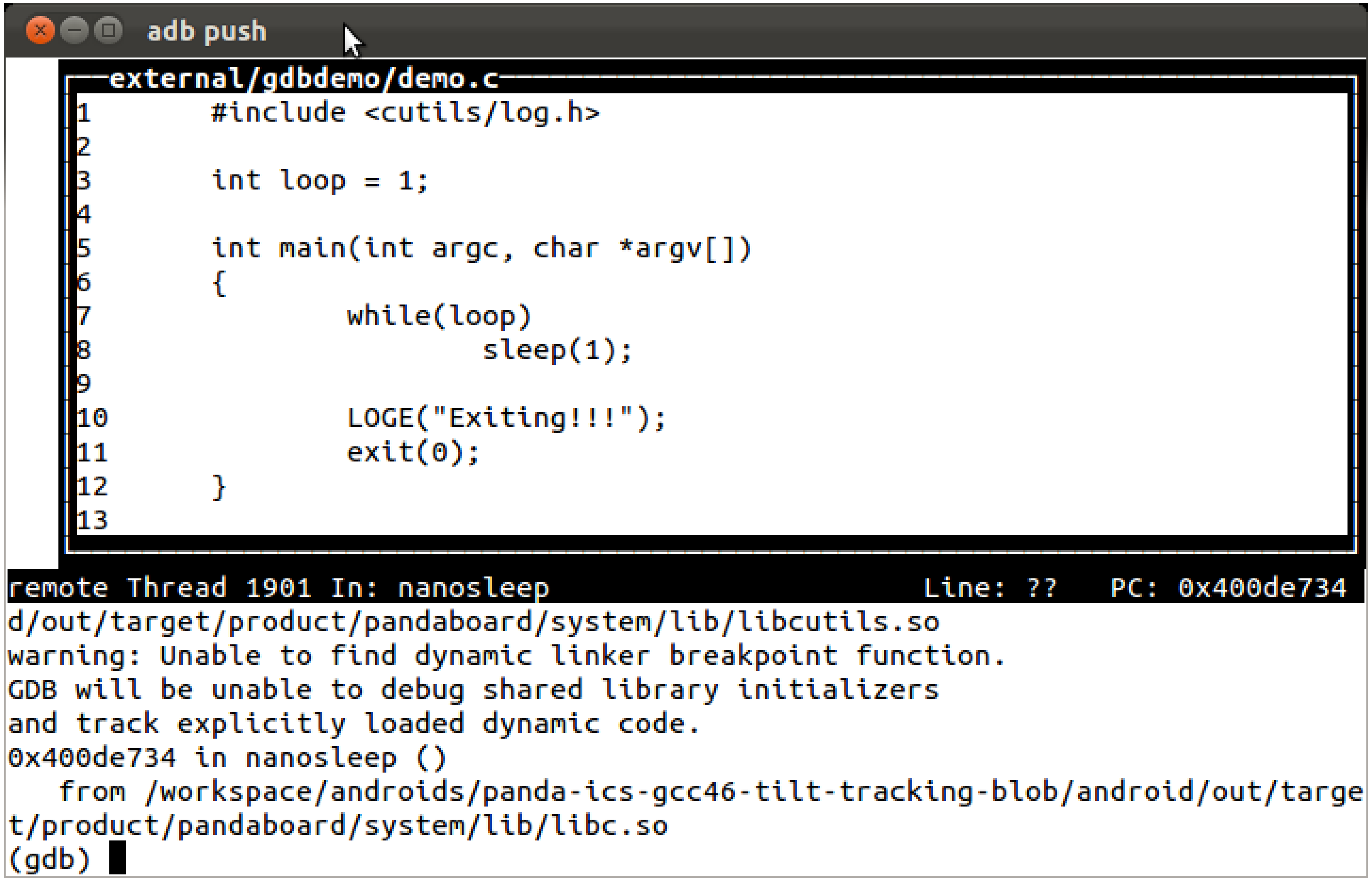
```
external/gdbdemo/demo.c
        {
                while(loop)
                        sleep(1);

                LOGE("Exiting!!!");
                exit(0);
        }
```

```
exec No process In:                                                Line: ??    PC: ??
Reading symbols from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/andr
oid/out/target/product/pandaboard/system/bin/gdbdemo...(no debugging symbols fou
nd)...done.
(gdb) symbol-file out/target/product/pandaboard/symbols/system/bin/gdbdemo
Reading symbols from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/andr
oid/out/target/product/pandaboard/symbols/system/bin/gdbdemo...done.
(gdb)  set solib-search-path out/target/product/pandaboard/system/lib/
(gdb) 
```

Connect to Remote

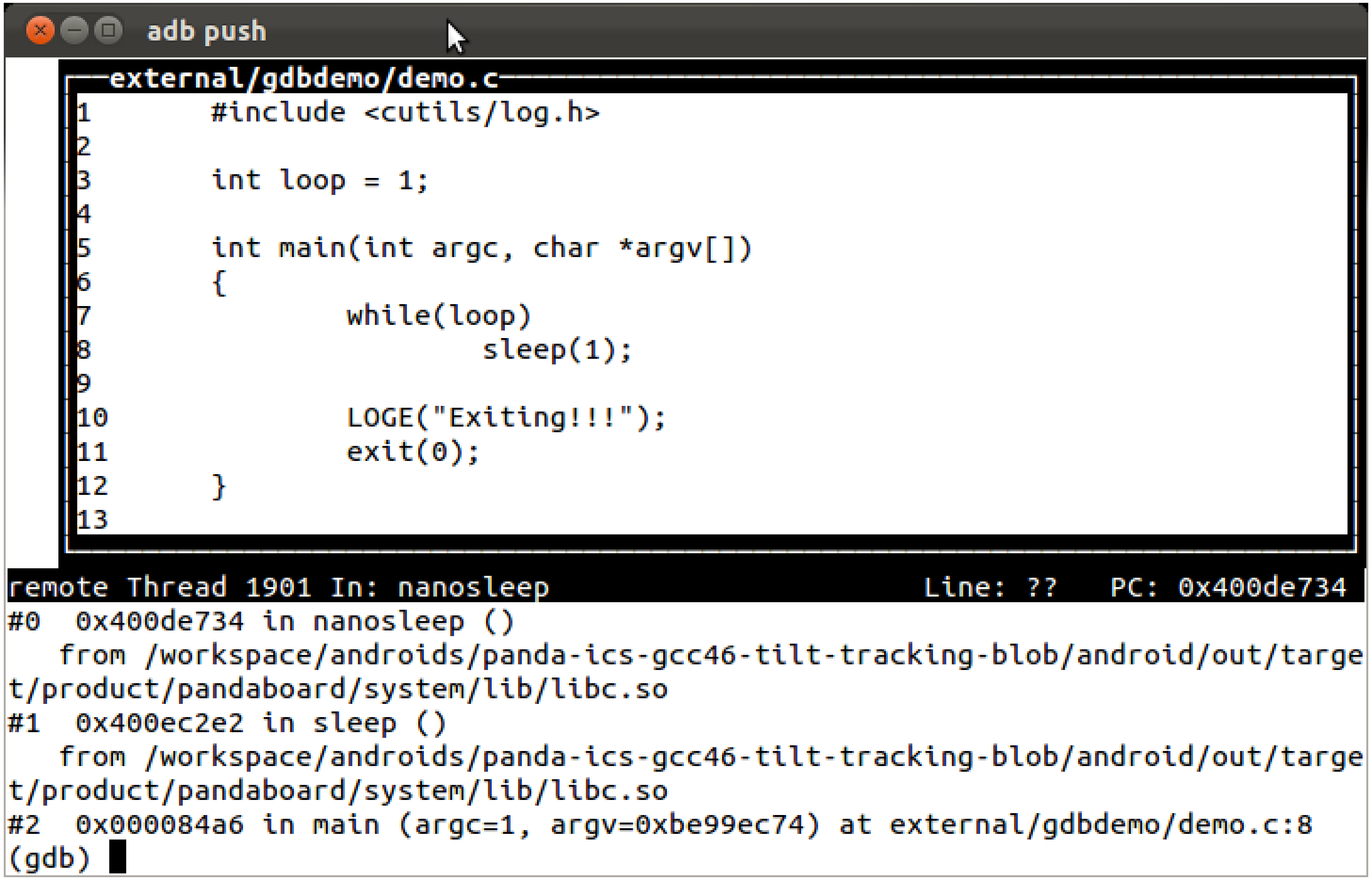
```
(gdb) target remote :5039
```

Connect to Remote



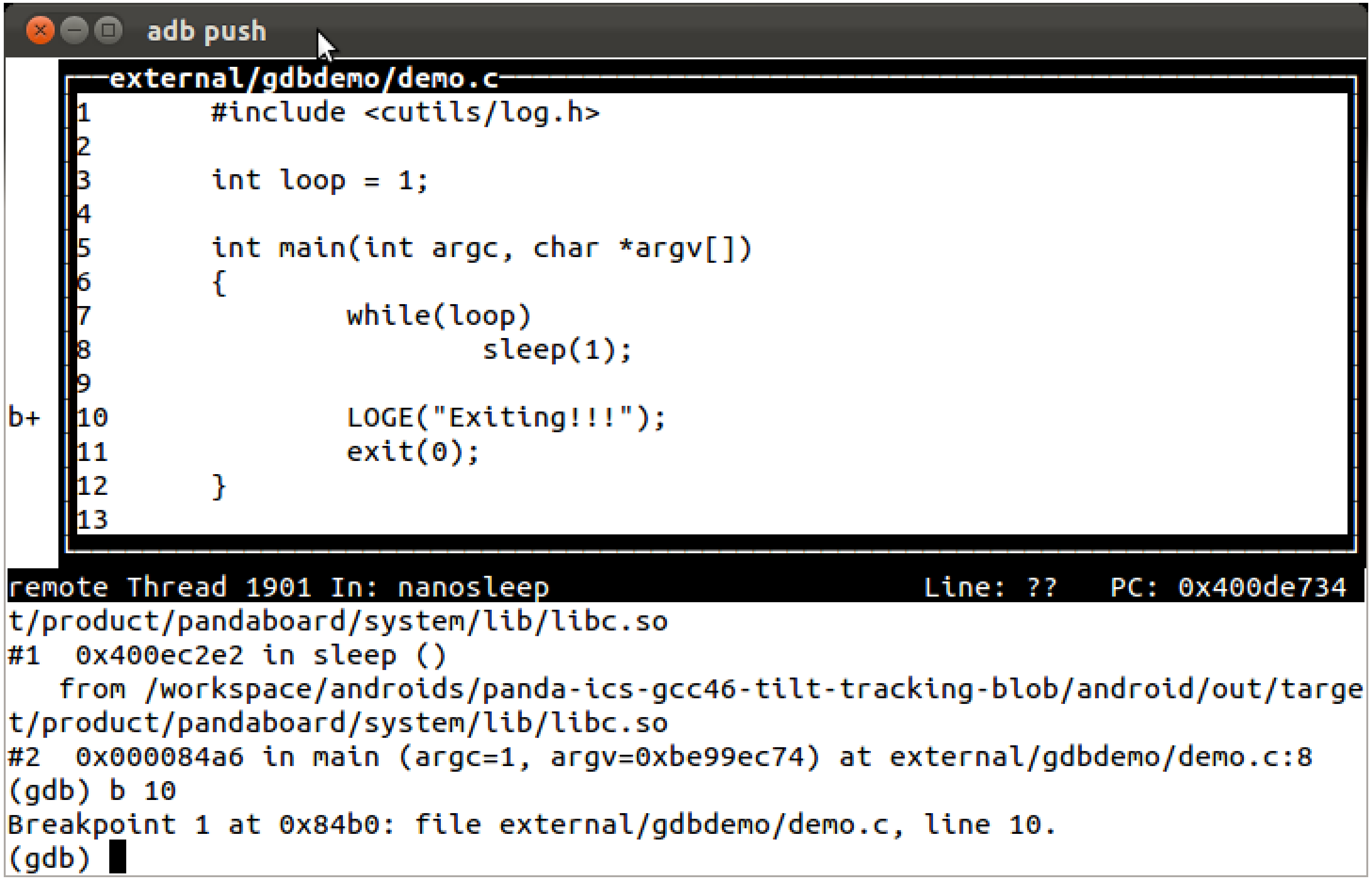
```
external/gdbdemo/demo.c
#include <cutils/log.h>

int loop = 1;

int main(int argc, char *argv[])
{
        while(loop)
                sleep(1);

        LOGE("Exiting!!!");
        exit(0);
}

remote Thread 1901 In: nanosleep                     Line: ??   PC: 0x400de734
d/out/target/product/pandaboard/system/lib/libcutils.so
warning: Unable to find dynamic linker breakpoint function.
GDB will be unable to debug shared library initializers
and track explicitly loaded dynamic code.
0x400de734 in nanosleep ()
   from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/android/out/targe
t/product/pandaboard/system/lib/libc.so
(gdb) 
```

where



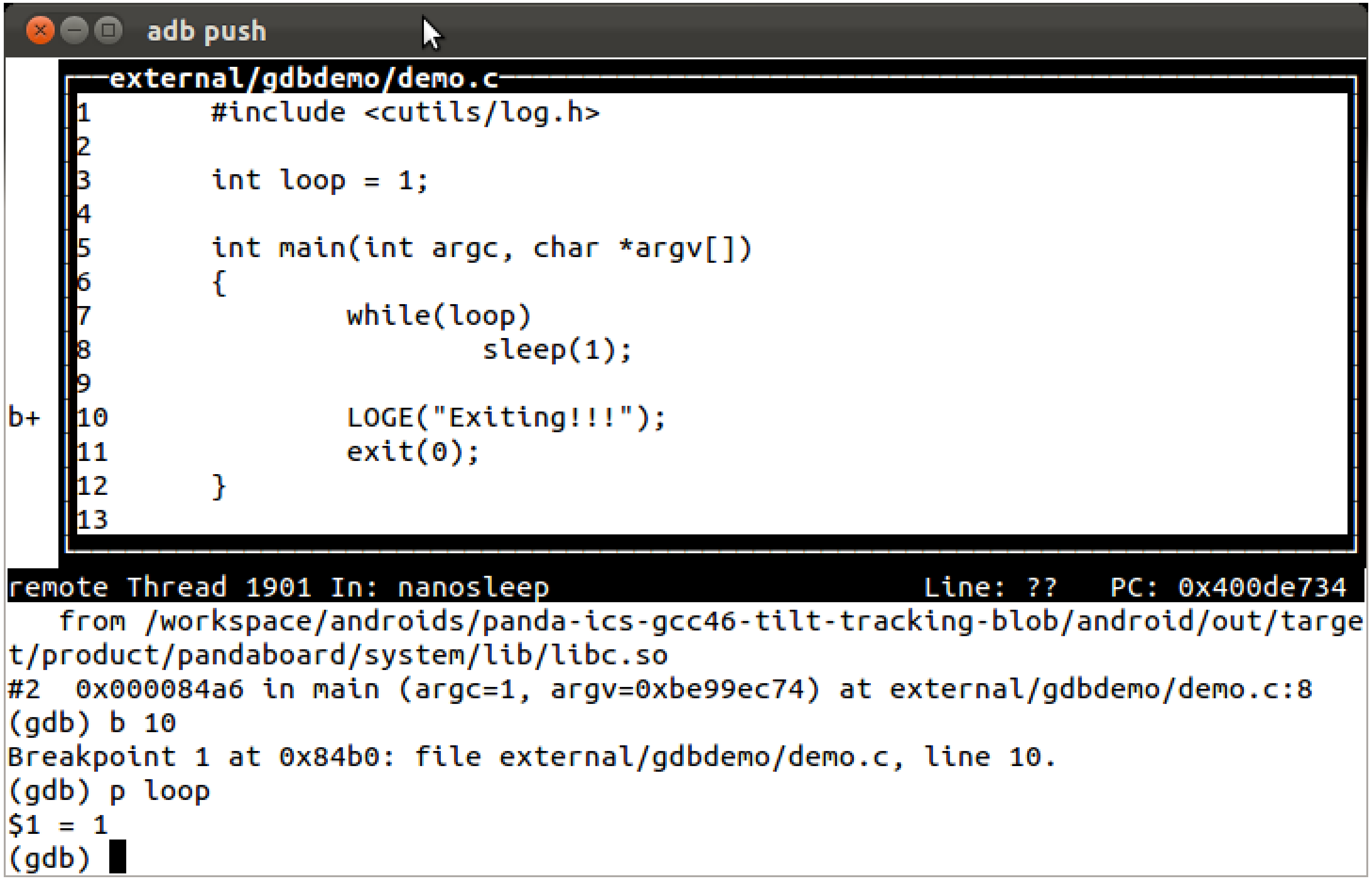
```
-external/gdbdemo/demo.c-
1       #include <cutils/log.h>
2
3       int loop = 1;
4
5       int main(int argc, char *argv[])
6       {
7               while(loop)
8                       sleep(1);
9
10              LOGE("Exiting!!!");
11              exit(0);
12      }
13
remote Thread 1901 In: nanosleep                   Line: ??   PC: 0x400de734
#0  0x400de734 in nanosleep ()
   from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/android/out/targe
t/product/pandaboard/system/lib/libc.so
#1  0x400ec2e2 in sleep ()
   from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/android/out/targe
t/product/pandaboard/system/lib/libc.so
#2  0x000084a6 in main (argc=1, argv=0xbe99ec74) at external/gdbdemo/demo.c:8
(gdb) 
```

b 10



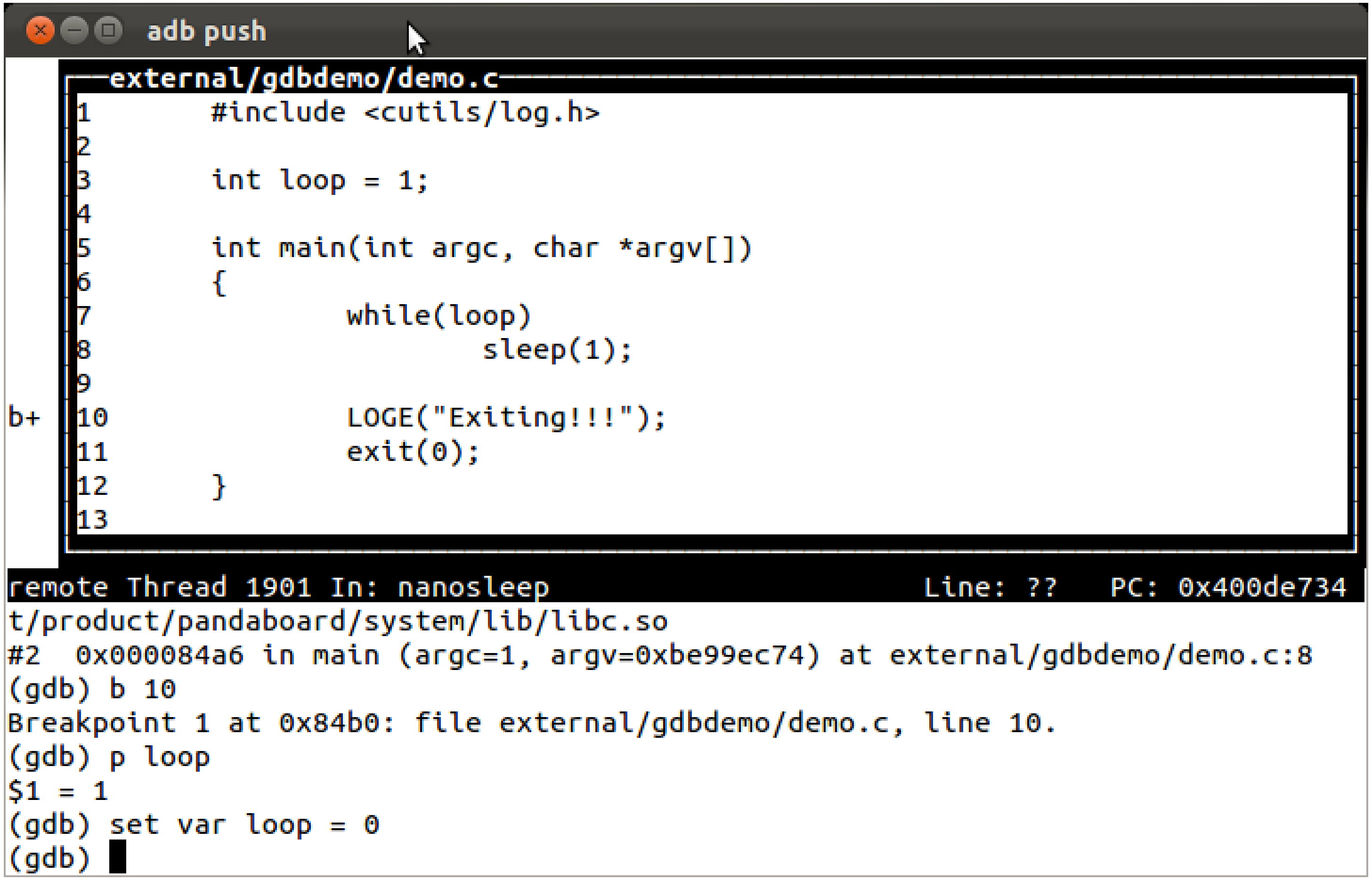
```
   ┌─external/gdbdemo/demo.c───────────────────────────────────────────────────────┐
   │1       #include <cutils/log.h>
   │2
   │3       int loop = 1;
   │4
   │5       int main(int argc, char *argv[])
   │6       {
   │7               while(loop)
   │8                       sleep(1);
   │9
b+ │10              LOGE("Exiting!!!");
   │11              exit(0);
   │12      }
   │13
   └───────────────────────────────────────────────────────────────────────────────┘
remote Thread 1901 In: nanosleep                                  Line: ??   PC: 0x400de734
t/product/pandaboard/system/lib/libc.so
#1  0x400ec2e2 in sleep ()
   from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/android/out/targe
t/product/pandaboard/system/lib/libc.so
#2  0x000084a6 in main (argc=1, argv=0xbe99ec74) at external/gdbdemo/demo.c:8
(gdb) b 10
Breakpoint 1 at 0x84b0: file external/gdbdemo/demo.c, line 10.
(gdb) █
```

p loop



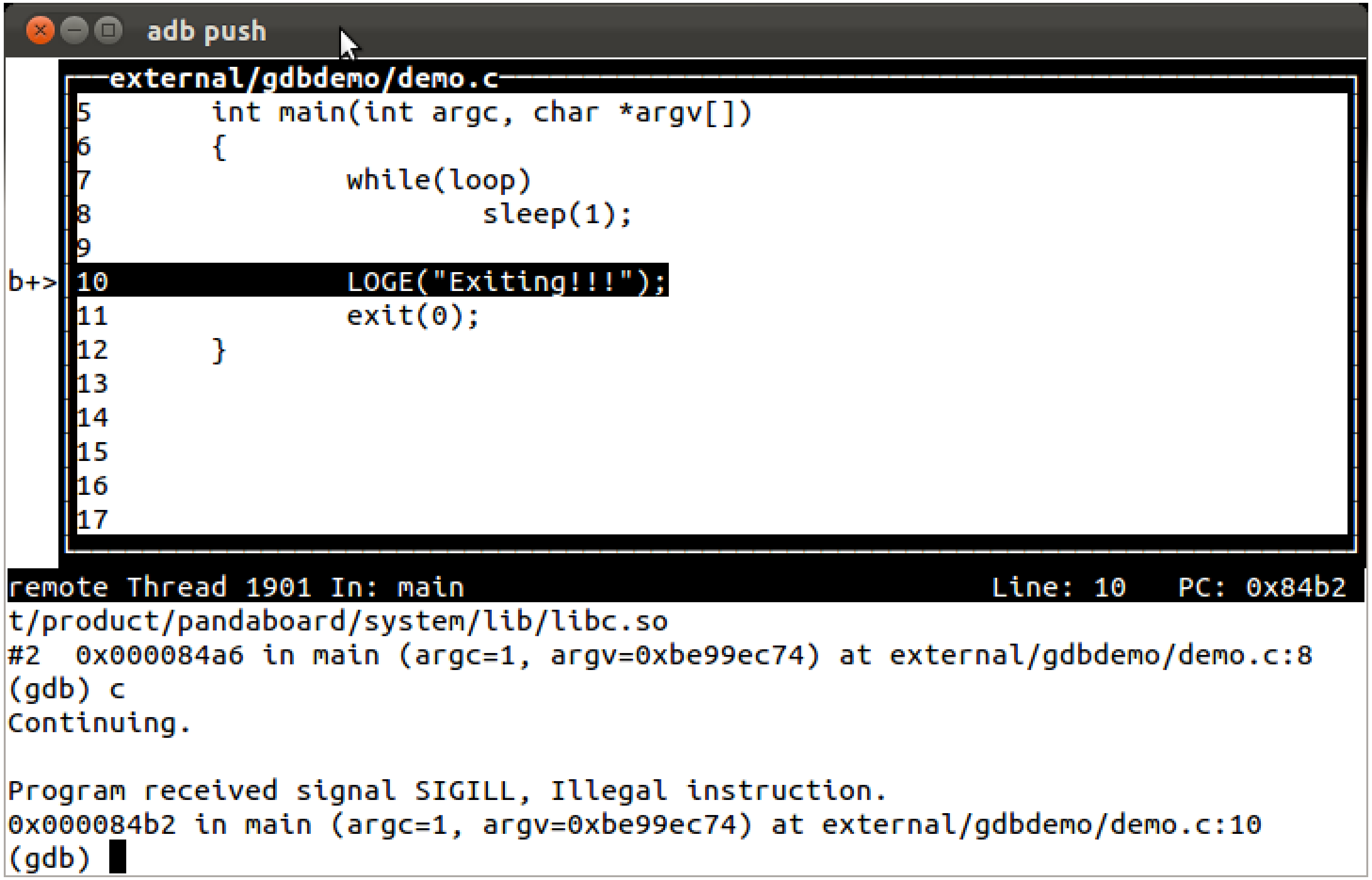
```
       ┌──external/gdbdemo/demo.c─────────────────────────────────────────────┐
       │1       #include <cutils/log.h>                                        │
       │2                                                                      │
       │3       int loop = 1;                                                  │
       │4                                                                      │
       │5       int main(int argc, char *argv[])                               │
       │6       {                                                              │
       │7               while(loop)                                            │
       │8                       sleep(1);                                      │
       │9                                                                      │
b+     │10              LOGE("Exiting!!!");                                    │
       │11              exit(0);                                               │
       │12      }                                                              │
       │13                                                                     │
       └───────────────────────────────────────────────────────────────────────┘
remote Thread 1901 In: nanosleep                          Line: ??   PC: 0x400de734
   from /workspace/androids/panda-ics-gcc46-tilt-tracking-blob/android/out/targe
t/product/pandaboard/system/lib/libc.so
#2  0x000084a6 in main (argc=1, argv=0xbe99ec74) at external/gdbdemo/demo.c:8
(gdb) b 10
Breakpoint 1 at 0x84b0: file external/gdbdemo/demo.c, line 10.
(gdb) p loop
$1 = 1
(gdb) 
```

set var loop = 0



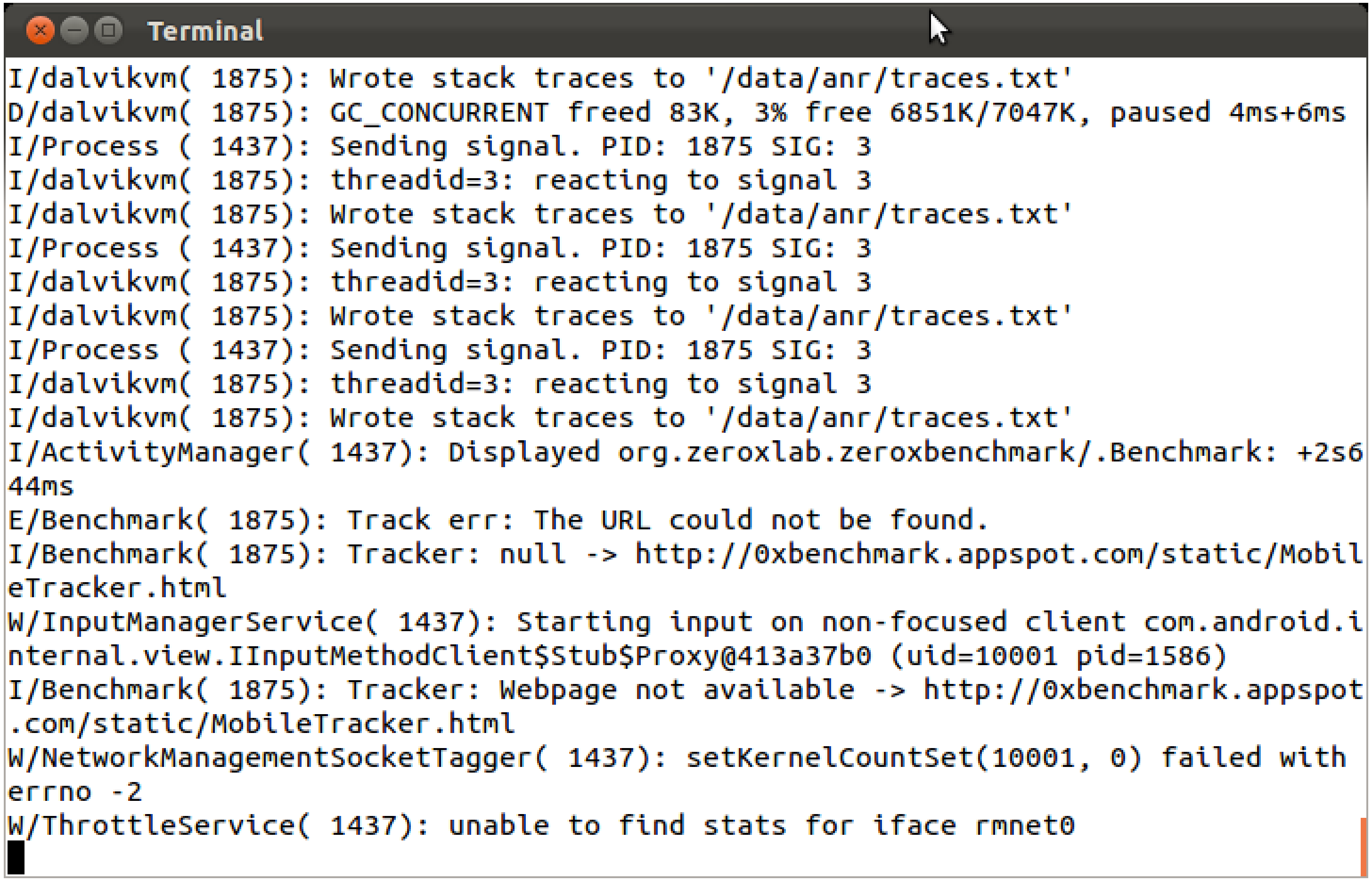
```
   ┌─external/gdbdemo/demo.c──────────────────────────────────────────────
   │1       #include <cutils/log.h>
   │2
   │3       int loop = 1;
   │4
   │5       int main(int argc, char *argv[])
   │6       {
   │7               while(loop)
   │8                       sleep(1);
   │9
b+ │10              LOGE("Exiting!!!");
   │11              exit(0);
   │12      }
   │13
   └──────────────────────────────────────────────────────────────────────
remote Thread 1901 In: nanosleep                     Line: ??   PC: 0x400de734
t/product/pandaboard/system/lib/libc.so
#2  0x000084a6 in main (argc=1, argv=0xbe99ec74) at external/gdbdemo/demo.c:8
(gdb) b 10
Breakpoint 1 at 0x84b0: file external/gdbdemo/demo.c, line 10.
(gdb) p loop
$1 = 1
(gdb) set var loop = 0
(gdb) █
```

C



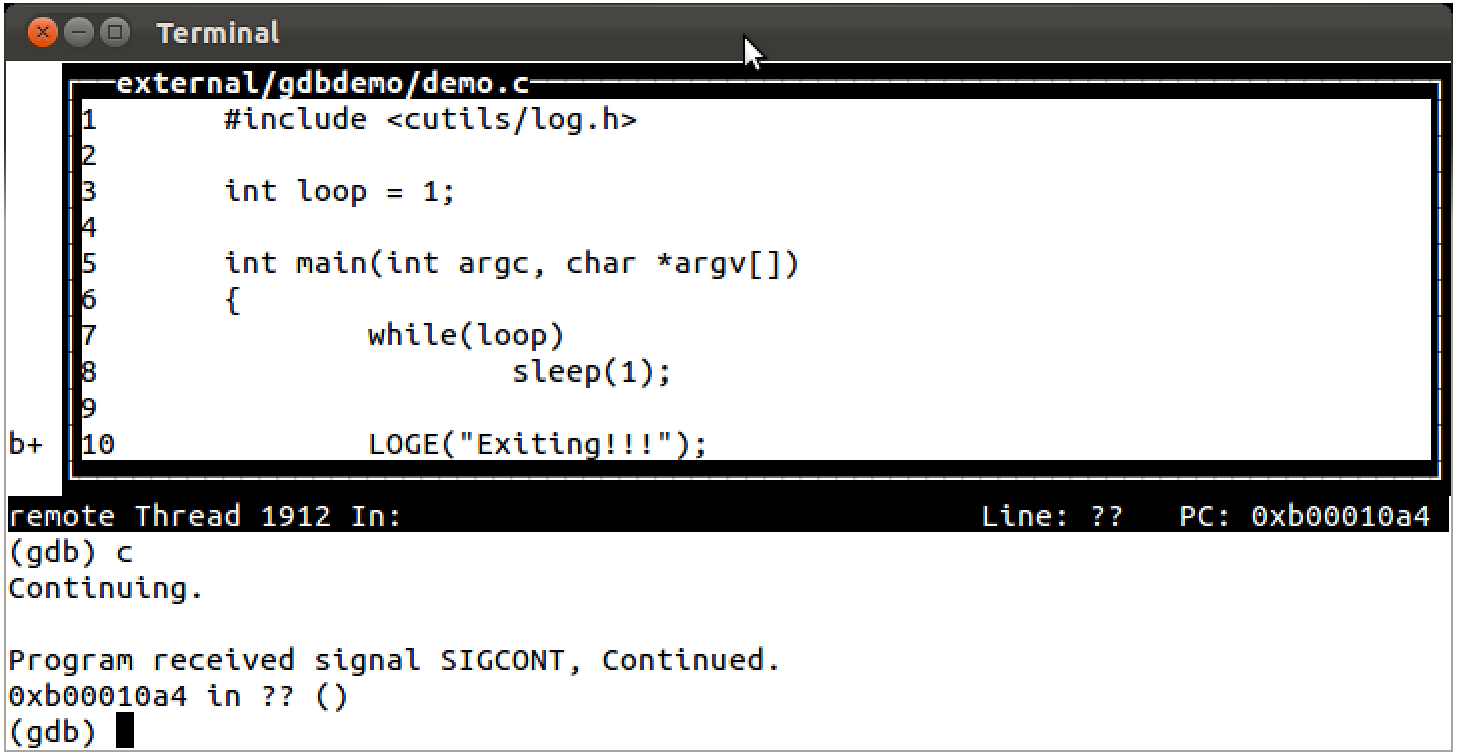
```
   external/gdbdemo/demo.c
   5       int main(int argc, char *argv[])
   6       {
   7               while(loop)
   8                       sleep(1);
   9
b+>10              LOGE("Exiting!!!");
   11              exit(0);
   12      }
   13
   14
   15
   16
   17
remote Thread 1901 In: main                                 Line: 10   PC: 0x84b2
t/product/pandaboard/system/lib/libc.so
#2  0x000084a6 in main (argc=1, argv=0xbe99ec74) at external/gdbdemo/demo.c:8
(gdb) c
Continuing.

Program received signal SIGILL, Illegal instruction.
0x000084b2 in main (argc=1, argv=0xbe99ec74) at external/gdbdemo/demo.c:10
(gdb) 
```

adb logcat



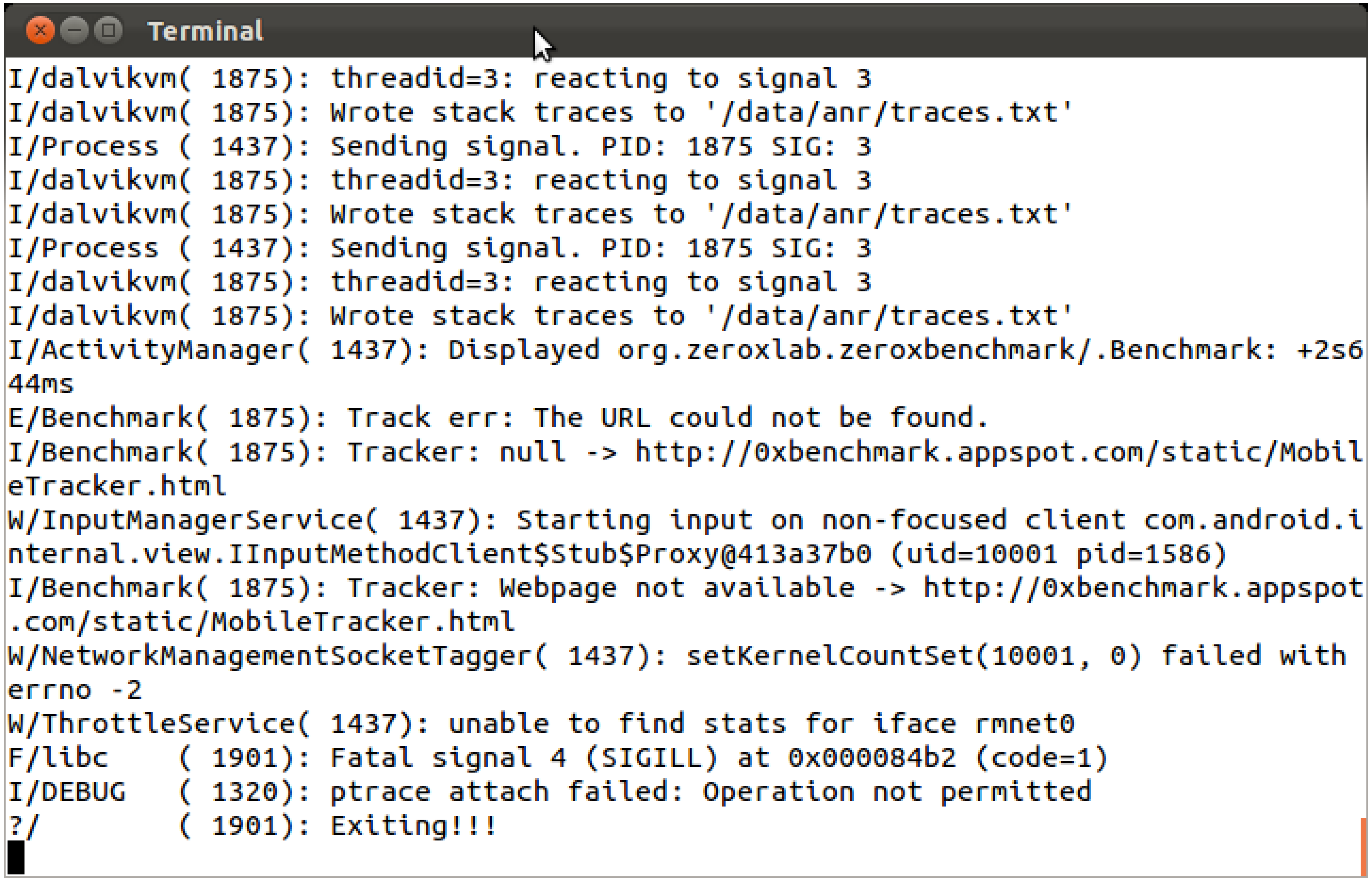
```
I/dalvikvm( 1875): Wrote stack traces to '/data/anr/traces.txt'
D/dalvikvm( 1875): GC_CONCURRENT freed 83K, 3% free 6851K/7047K, paused 4ms+6ms
I/Process ( 1437): Sending signal. PID: 1875 SIG: 3
I/dalvikvm( 1875): threadid=3: reacting to signal 3
I/dalvikvm( 1875): Wrote stack traces to '/data/anr/traces.txt'
I/Process ( 1437): Sending signal. PID: 1875 SIG: 3
I/dalvikvm( 1875): threadid=3: reacting to signal 3
I/dalvikvm( 1875): Wrote stack traces to '/data/anr/traces.txt'
I/Process ( 1437): Sending signal. PID: 1875 SIG: 3
I/dalvikvm( 1875): threadid=3: reacting to signal 3
I/dalvikvm( 1875): Wrote stack traces to '/data/anr/traces.txt'
I/ActivityManager( 1437): Displayed org.zeroxlab.zeroxbenchmark/.Benchmark: +2s6
44ms
E/Benchmark( 1875): Track err: The URL could not be found.
I/Benchmark( 1875): Tracker: null -> http://0xbenchmark.appspot.com/static/Mobil
eTracker.html
W/InputManagerService( 1437): Starting input on non-focused client com.android.i
nternal.view.IInputMethodClient$Stub$Proxy@413a37b0 (uid=10001 pid=1586)
I/Benchmark( 1875): Tracker: Webpage not available -> http://0xbenchmark.appspot
.com/static/MobileTracker.html
W/NetworkManagementSocketTagger( 1437): setKernelCountSet(10001, 0) failed with
errno -2
W/ThrottleService( 1437): unable to find stats for iface rmnet0
```

c



```
   ┌─external/gdbdemo/demo.c─────────────────────────────────────────────┐
   │1       #include <cutils/log.h>
   │2
   │3       int loop = 1;
   │4
   │5       int main(int argc, char *argv[])
   │6       {
   │7               while(loop)
   │8                       sleep(1);
   │9
b+ │10              LOGE("Exiting!!!");
   └─────────────────────────────────────────────────────────────────────┘
remote Thread 1912 In:                                Line: ??   PC: 0xb00010a4
(gdb) c
Continuing.

Program received signal SIGCONT, Continued.
0xb00010a4 in ?? ()
(gdb) 
```

adb logcat



```
I/dalvikvm( 1875): threadid=3: reacting to signal 3
I/dalvikvm( 1875): Wrote stack traces to '/data/anr/traces.txt'
I/Process ( 1437): Sending signal. PID: 1875 SIG: 3
I/dalvikvm( 1875): threadid=3: reacting to signal 3
I/dalvikvm( 1875): Wrote stack traces to '/data/anr/traces.txt'
I/Process ( 1437): Sending signal. PID: 1875 SIG: 3
I/dalvikvm( 1875): threadid=3: reacting to signal 3
I/dalvikvm( 1875): Wrote stack traces to '/data/anr/traces.txt'
I/ActivityManager( 1437): Displayed org.zeroxlab.zeroxbenchmark/.Benchmark: +2s6
44ms
E/Benchmark( 1875): Track err: The URL could not be found.
I/Benchmark( 1875): Tracker: null -> http://0xbenchmark.appspot.com/static/Mobil
eTracker.html
W/InputManagerService( 1437): Starting input on non-focused client com.android.i
nternal.view.IInputMethodClient$Stub$Proxy@413a37b0 (uid=10001 pid=1586)
I/Benchmark( 1875): Tracker: Webpage not available -> http://0xbenchmark.appspot
.com/static/MobileTracker.html
W/NetworkManagementSocketTagger( 1437): setKernelCountSet(10001, 0) failed with
errno -2
W/ThrottleService( 1437): unable to find stats for iface rmnet0
F/libc    ( 1901): Fatal signal 4 (SIGILL) at 0x000084b2 (code=1)
I/DEBUG   ( 1320): ptrace attach failed: Operation not permitted
?/        ( 1901): Exiting!!!
```

Linaro

Debugging the Kernel

- A Quick Introduction to Linaro
- Using Linaro's Android Platform
  - Get and Use a Premade Build
  - Build and Use the Platform from Source
  - Debug with GDB
  - **Debugging the Kernel**
    - Rebuild the Kernel
    - Change the Kernel's Config
  - Debugging the Kernel and User Space at the Same Time
  - Native Debugging with ARM's DS-5 Community Edition
- G1 Bring Up

Rebuild the Kernel

- A Quick Introduction to Linaro
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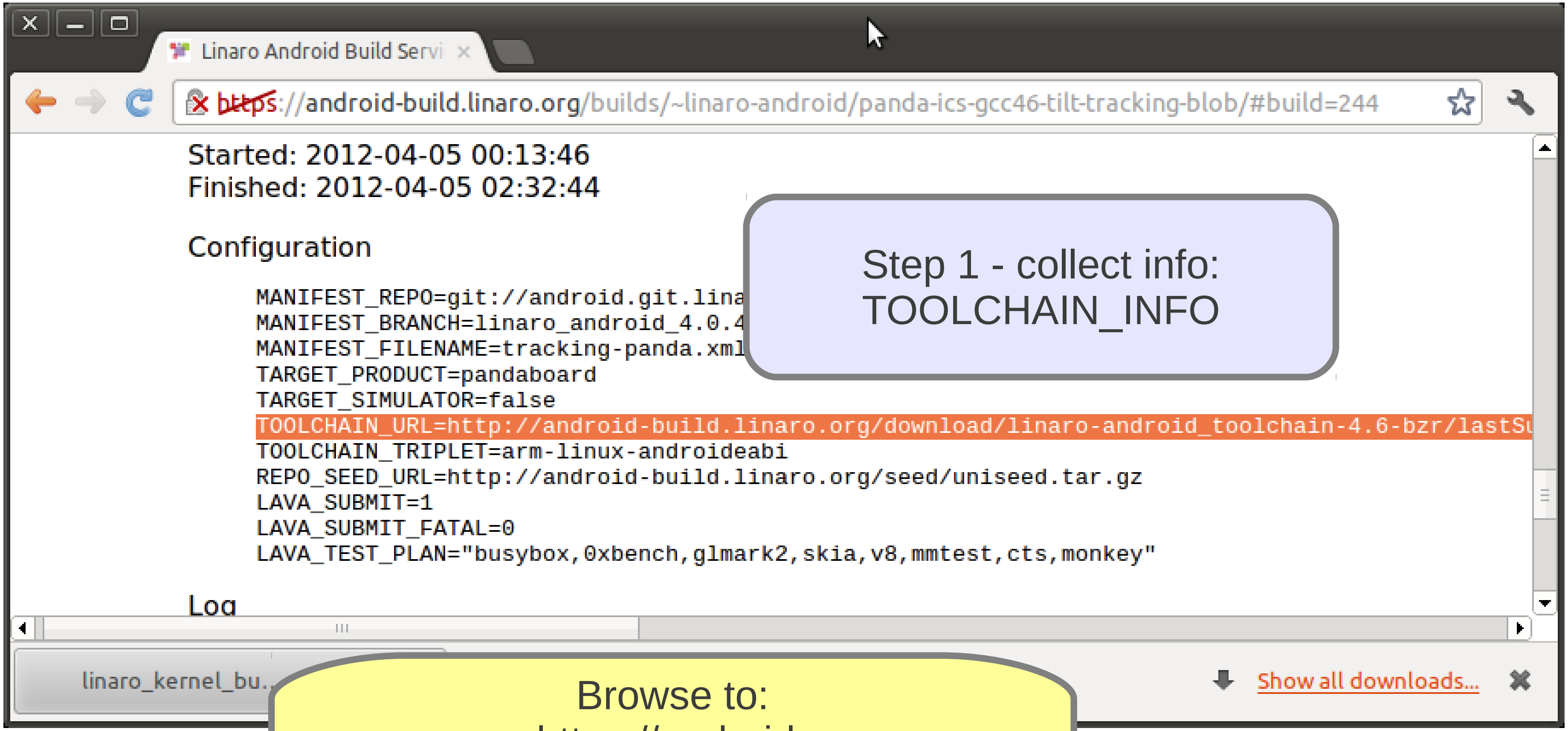
  - Debugging the Kernel
    - **Rebuild the Kernel**
    - Change the Kernel's Config
  - Debugging the Kernel and User Space at the Same Time
  - Native Debugging with ARM's DS-5 Community Edition
- G1 Bring Up

Rebuild the Kernel



Linaro Android Build Servi
~~https~~://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/#build=244
linaro_kernel_bu...
Show all downloads...

Started: 2012-04-05 00:13:46
Finished: 2012-04-05 02:32:44

Configuration

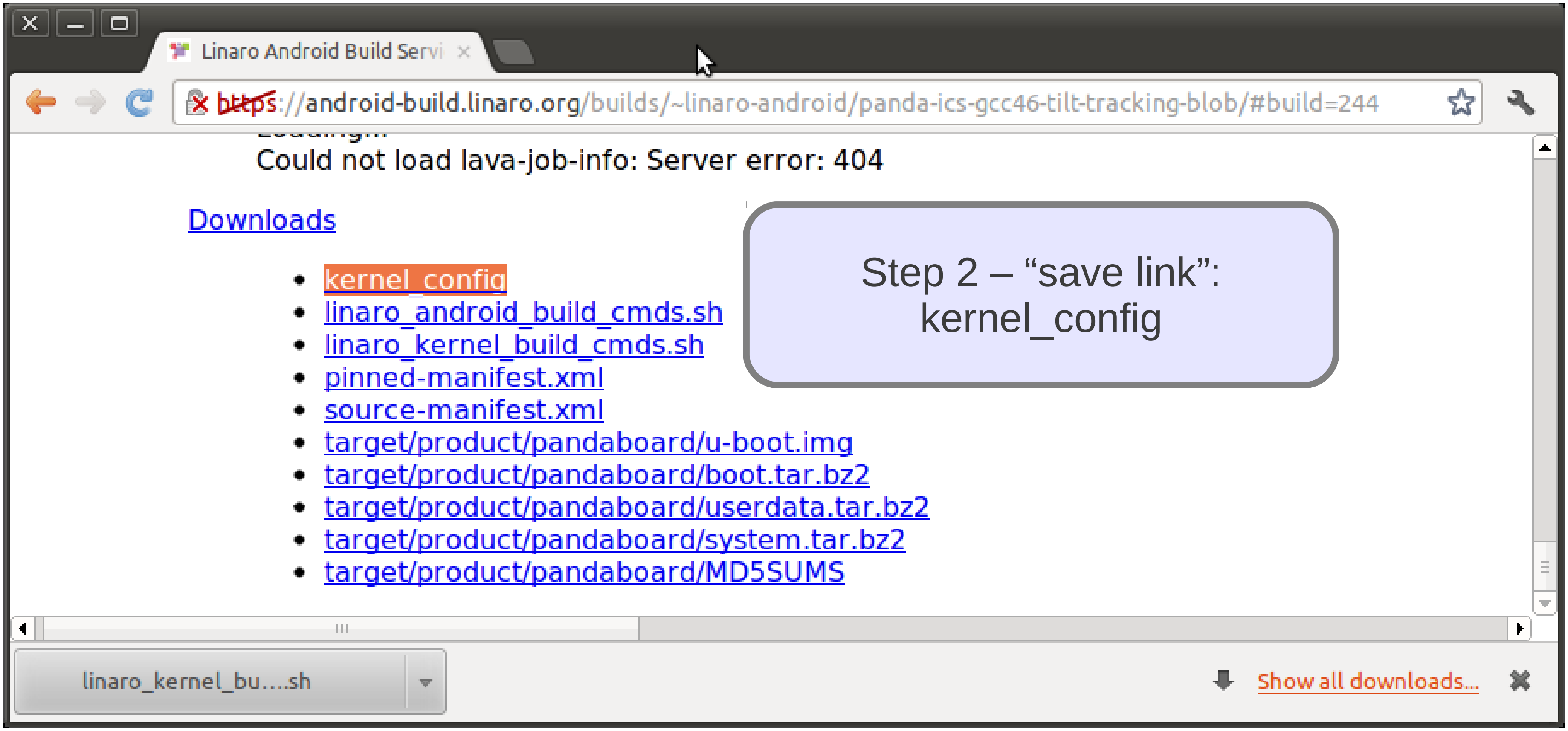
```
MANIFEST_REPO=git://android.git.lina
MANIFEST_BRANCH=linaro_android_4.0.4
MANIFEST_FILENAME=tracking-panda.xml
TARGET_PRODUCT=pandaboard
TARGET_SIMULATOR=false
TOOLCHAIN_URL=http://android-build.linaro.org/download/linaro-android_toolchain-4.6-bzr/lastSu
TOOLCHAIN_TRIPLET=arm-linux-androideabi
REPO_SEED_URL=http://android-build.linaro.org/seed/uniseed.tar.gz
LAVA_SUBMIT=1
LAVA_SUBMIT_FATAL=0
LAVA_TEST_PLAN="busybox,0xbench,glmark2,skia,v8,mmtest,cts,monkey"
```

Log

Step 1 - collect info:
TOOLCHAIN_INFO

Browse to:
https://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/#build=244

Rebuild the Kernel



~~https~~://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/#build=244

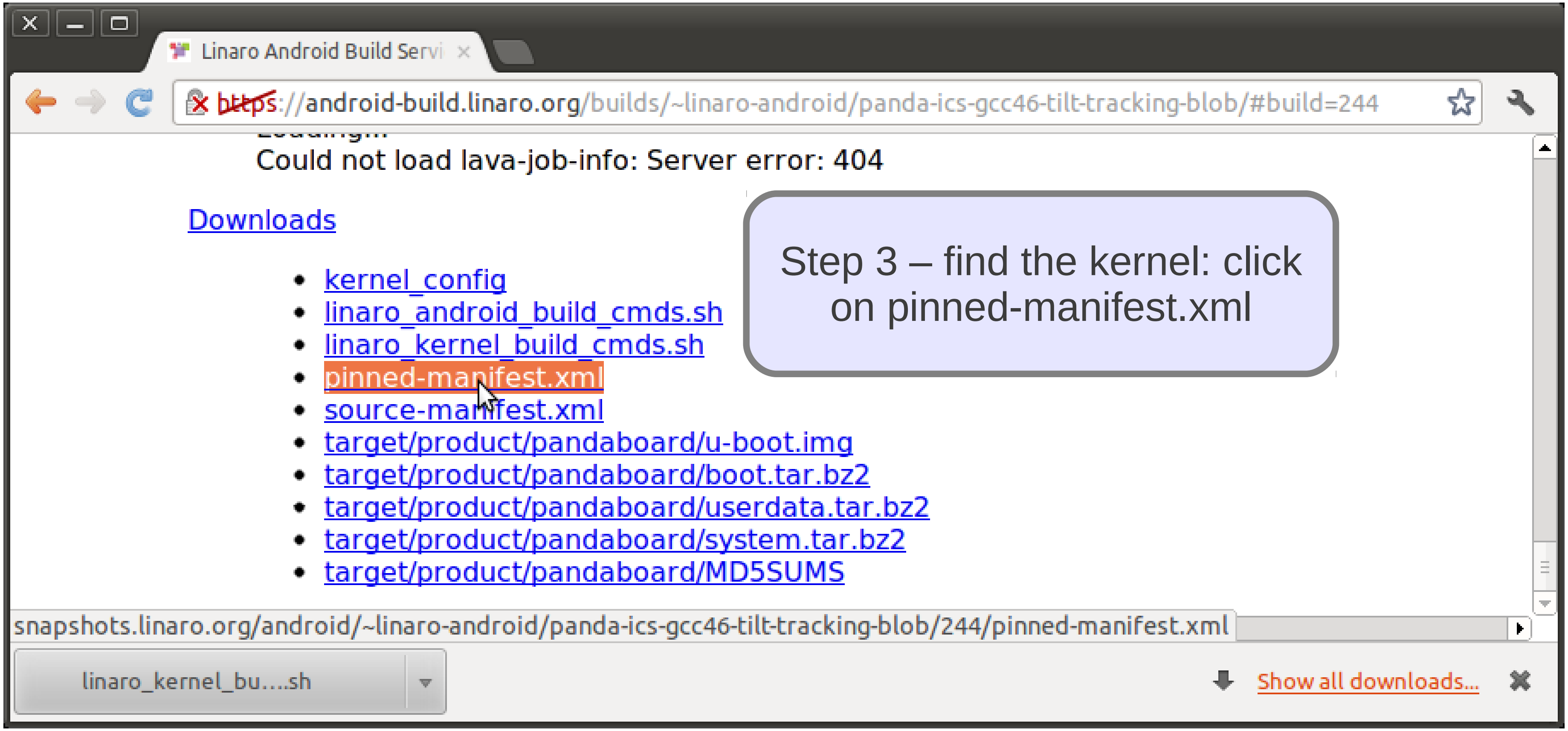
Could not load lava-job-info: Server error: 404

Downloads

- kernel_config
- linaro_android_build_cmds.sh
- linaro_kernel_build_cmds.sh
- pinned-manifest.xml
- source-manifest.xml
- target/product/pandaboard/u-boot.img
- target/product/pandaboard/boot.tar.bz2
- target/product/pandaboard/userdata.tar.bz2
- target/product/pandaboard/system.tar.bz2
- target/product/pandaboard/MD5SUMS

Step 2 – “save link”:
kernel_config

Rebuild the Kernel



Linaro Android Build Servi
https://android-build.linaro.org/builds/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/#build=244

Could not load lava-job-info: Server error: 404

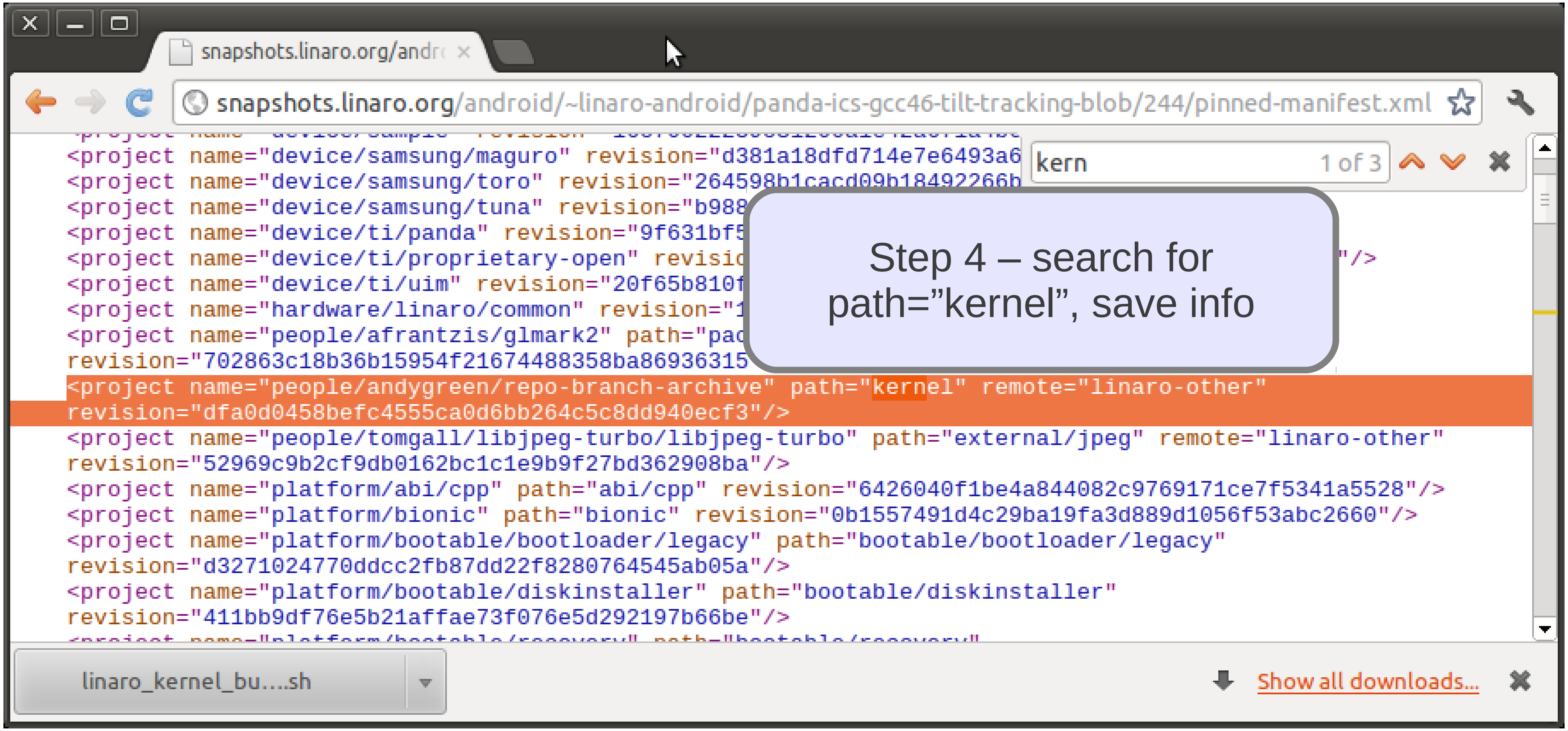
Downloads

- kernel_config
- linaro_android_build_cmds.sh
- linaro_kernel_build_cmds.sh
- pinned-manifest.xml
- source-manifest.xml
- target/product/pandaboard/u-boot.img
- target/product/pandaboard/boot.tar.bz2
- target/product/pandaboard/userdata.tar.bz2
- target/product/pandaboard/system.tar.bz2
- target/product/pandaboard/MD5SUMS

snapshots.linaro.org/android/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/244/pinned-manifest.xml

Step 3 – find the kernel: click on pinned-manifest.xml

Rebuild the Kernel



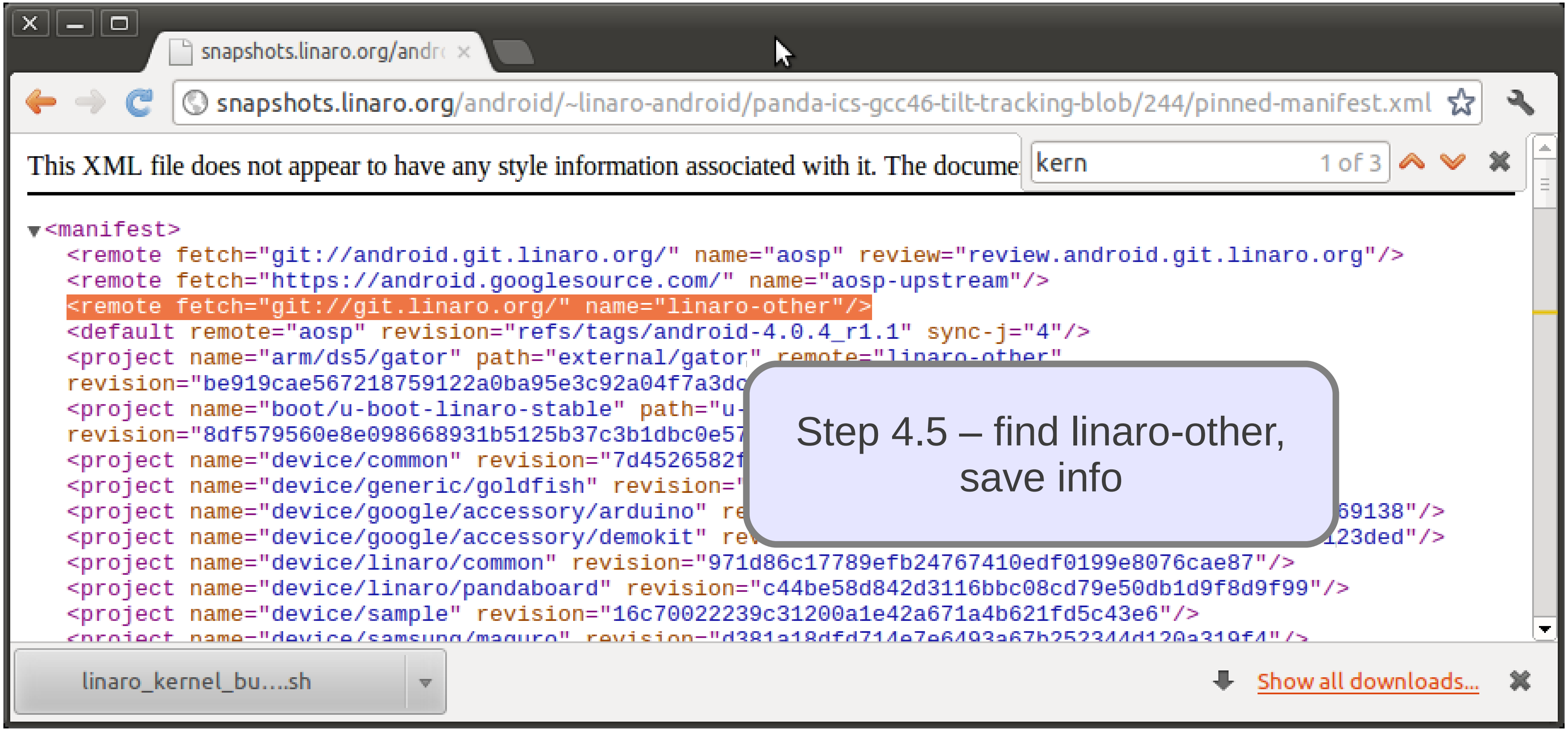
snapshots.linaro.org/andr
snapshots.linaro.org/android/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/244/pinned-manifest.xml
kern
1 of 3
linaro_kernel_bu....sh
Show all downloads...

```
<project name="device/samsung/maguro" revision="d381a18dfd714e7e6493a6
<project name="device/samsung/toro" revision="264598b1cacd09b18492266b
<project name="device/samsung/tuna" revision="b988
<project name="device/ti/panda" revision="9f631bf5
<project name="device/ti/proprietary-open" revisio                    "/>
<project name="device/ti/uim" revision="20f65b810f
<project name="hardware/linaro/common" revision="1
<project name="people/afrantzis/glmark2" path="pac
revision="702863c18b36b15954f21674488358ba86936315
<project name="people/andygreen/repo-branch-archive" path="kernel" remote="linaro-other"
revision="dfa0d0458befc4555ca0d6bb264c5c8dd940ecf3"/>
<project name="people/tomgall/libjpeg-turbo/libjpeg-turbo" path="external/jpeg" remote="linaro-other"
revision="52969c9b2cf9db0162bc1c1e9b9f27bd362908ba"/>
<project name="platform/abi/cpp" path="abi/cpp" revision="6426040f1be4a844082c9769171ce7f5341a5528"/>
<project name="platform/bionic" path="bionic" revision="0b1557491d4c29ba19fa3d889d1056f53abc2660"/>
<project name="platform/bootable/bootloader/legacy" path="bootable/bootloader/legacy"
revision="d3271024770ddcc2fb87dd22f8280764545ab05a"/>
<project name="platform/bootable/diskinstaller" path="bootable/diskinstaller"
revision="411bb9df76e5b21affae73f076e5d292197b66be"/>
<project name="platform/bootable/recovery" path="bootable/recovery"
```

Step 4 – search for path=”kernel”, save info

HEY!
What's linaro-other?

Rebuild the Kernel



snapshots.linaro.org/andr
snapshots.linaro.org/android/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/244/pinned-manifest.xml
kern
1 of 3
linaro_kernel_bu....sh
Show all downloads...

This XML file does not appear to have any style information associated with it. The docume

```
▼<manifest>
   <remote fetch="git://android.git.linaro.org/" name="aosp" review="review.android.git.linaro.org"/>
   <remote fetch="https://android.googlesource.com/" name="aosp-upstream"/>
   <remote fetch="git://git.linaro.org/" name="linaro-other"/>
   <default remote="aosp" revision="refs/tags/android-4.0.4_r1.1" sync-j="4"/>
   <project name="arm/ds5/gator" path="external/gator" remote="linaro-other"
   revision="be919cae567218759122a0ba95e3c92a04f7a3dc
   <project name="boot/u-boot-linaro-stable" path="u-
   revision="8df579560e8e098668931b5125b37c3b1dbc0e57
   <project name="device/common" revision="7d4526582f
   <project name="device/generic/goldfish" revision="
   <project name="device/google/accessory/arduino" re                                  69138"/>
   <project name="device/google/accessory/demokit" rev                                 123ded"/>
   <project name="device/linaro/common" revision="971d86c17789efb24767410edf0199e8076cae87"/>
   <project name="device/linaro/pandaboard" revision="c44be58d842d3116bbc08cd79e50db1d9f8d9f99"/>
   <project name="device/sample" revision="16c70022239c31200a1e42a671a4b621fd5c43e6"/>
   <project name="device/samsung/maguro" revision="d381a18dfd714e7e6493a67b252344d120a319f4"/>
```

Step 4.5 – find linaro-other, save info

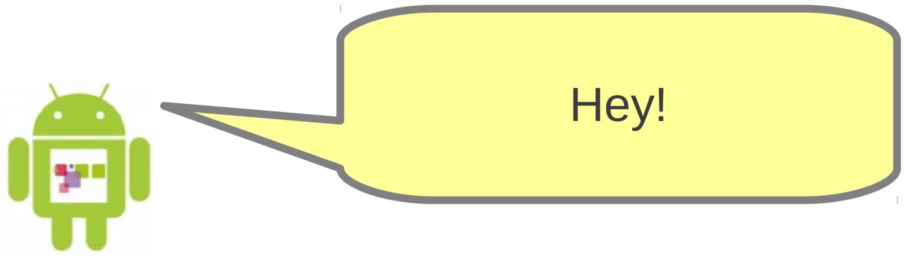
Thanks...

Gets Tools and Source

```
mkdir rebuild_kernel; cd rebuild_kernel

curl -q http://android-build.linaro.org/download/linaro-android_toolchain-4.6-
bzr/lastSuccessful/archive/build/out/android-toolchain-eabi-4.6-daily-linux-x86.tar.bz2
>  android-toolchain-eabi.tar.bz2

tar -jxvf android-toolchain-eabi.tar.bz2

export CROSS_COMPILE=/workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/android-toolchain-eabi/bin/arm-linux-androideabi-

mkdir out

curl -q http://snapshots.linaro.org/android/~linaro-android/panda-ics-gcc46-tilt-
tracking-blob/244/kernel_config > out/.config

git clone git://git.linaro.org/people/andygreen/repo-branch-archive kernel

cd kernel

git checkout dfa0d0458befc4555ca0d6bb264c5c8dd940ecf3

cd ..
```

Build

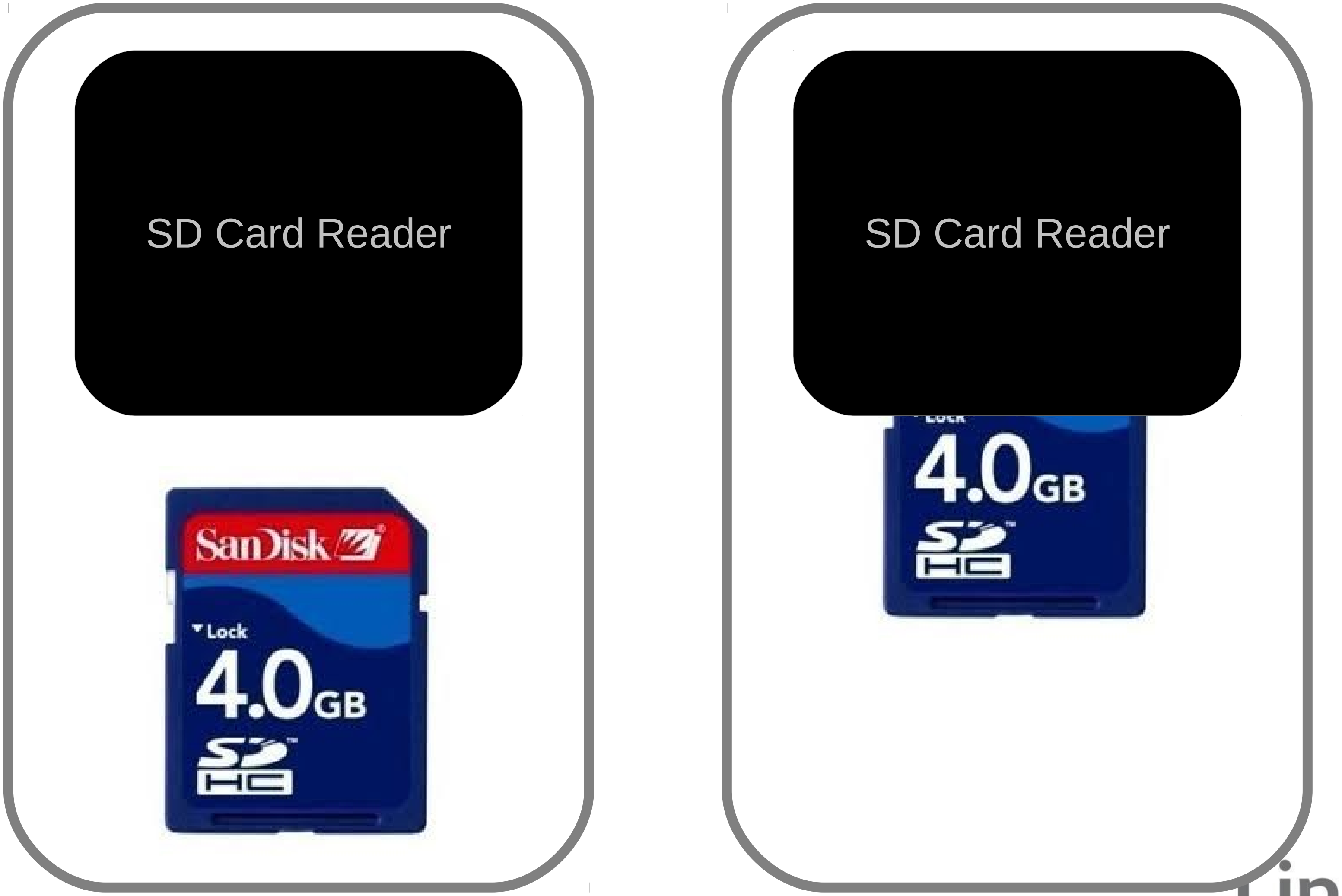
```
export CPUS=`grep -c processor /proc/cpuinfo`

make -j${CPUS} O=../out ARCH=arm CROSS_COMPILE=${CROSS_COMPILE} uImage
modules

mkdir ../out/modules_for_android

make O=../out ARCH=arm modules_install
INSTALL_MOD_PATH=../out/modules_for_android
```



Build

```
mkdir rebuild_kernel; cd rebuild_kernel

curl -q http://android-build.linaro.org/download/linaro-android_toolchain-4.6-bzr/lastSuccessful/archive/build/out/android-toolchain-eabi-4.6-daily-linux-x86.tar.bz2 >  android-toolchain-eabi.tar.bz2

tar -jxvf android-toolchain-eabi.tar.bz2

mkdir out

curl -q http://snapshots.linaro.org/android/~linaro-android/panda-ics-gcc46-tilt-tracking-blob/244/kernel_config > out/.config

git clone git://git.linaro.org/people/andygreen/repo-branch-archive kernel

cd kernel

git checkout dfa0d0458befc4555ca0d6bb264c5c8dd940ecf3

cd ..
```

Plug an SD Card In



SD Card Reader

SD Card Reader

Use

```
cd android

./linaro-image-tools/linaro-android-media-create \
--mmc /dev/sdc \
--dev panda \
--system out/target/product/pandaboard/system.tar.bz2 \
--userdata out/target/product/pandaboard/userdata.tar.bz2 \
--boot out/target/product/pandaboard/boot.tar.bz2

./install-binaries-4.0.3.sh /dev/sdc2

mkdir mnt

sudo mount /dev/sdc1 mnt

ls mnt

sudo cp ../rebuild_kernel/out/arch/arm/boot/uImage mnt

sudo umount mnt

sync
```

One sec...

What do you need little Android?

One sec...

Right...lets chat about that.

What about build naming?

android-build.linaro.org Build Naming

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  Debugging the Kernel
    Rebuild the Kernel
< android-build Build Naming
    Change the Kernel's Config
  Debugging the Kernel and User Space at the Same Time
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G1 Bring Up

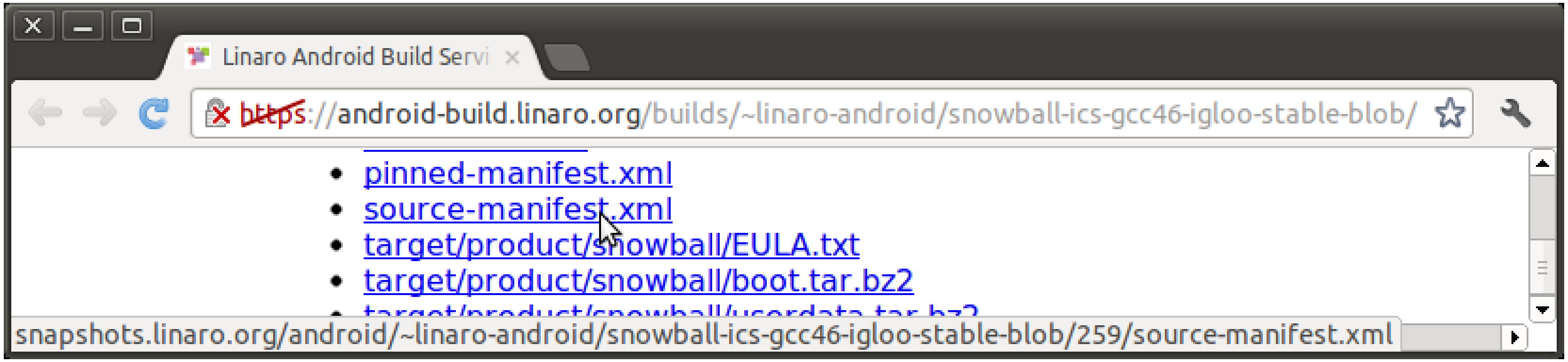
Name break down

Named by major build components

snowball-ics-gcc46-igloo-stable-blob

snowball	Board
ics	Android version
gcc46	Compiled with GCC
igloo	Kernel Community of Origen
stable	Type of Kernel branch
blob	How enablement is delivered

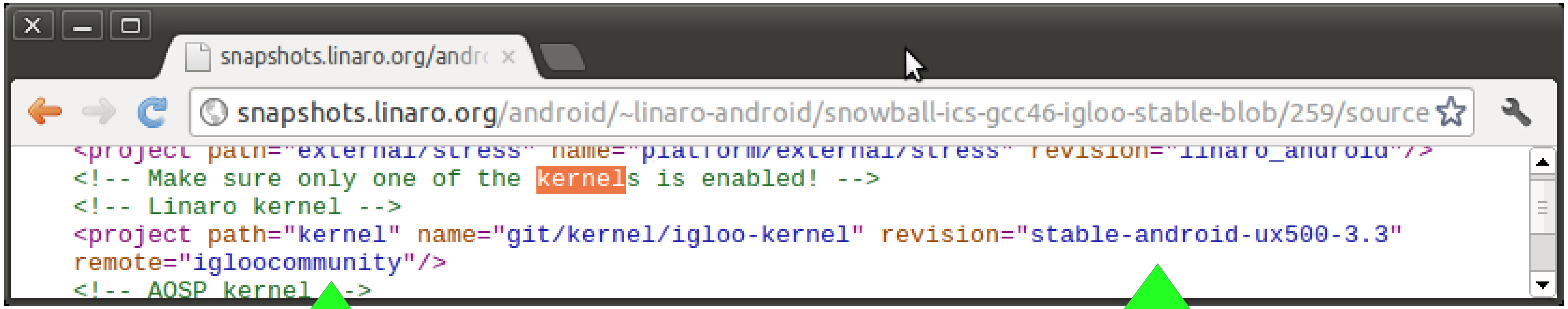
Kernel and Branch



~~https~~://android-build.linaro.org/builds/~linaro-android/snowball-ics-gcc46-igloo-stable-blob/

- pinned-manifest.xml
- source-manifest.xml
- target/product/snowball/EULA.txt
- target/product/snowball/boot.tar.bz2
- target/product/snowball/userdata.tar.bz2

snapshots.linaro.org/android/~linaro-android/snowball-ics-gcc46-igloo-stable-blob/259/source-manifest.xml



snapshots.linaro.org/android/~linaro-android/snowball-ics-gcc46-igloo-stable-blob/259/source

```
<project path="external/stress" name="platform/external/stress" revision="linaro_android"/>
<!-- Make sure only one of the kernels is enabled! -->
<!-- Linaro kernel -->
<project path="kernel" name="git/kernel/igloo-kernel" revision="stable-android-ux500-3.3"
remote="igloocommunity"/>
<!-- AOSP kernel -->
```

igloo

stable

Back to Rebuild the Kernel

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  Debugging the Kernel
    Rebuild the Kernel
        < android-build Build Naming
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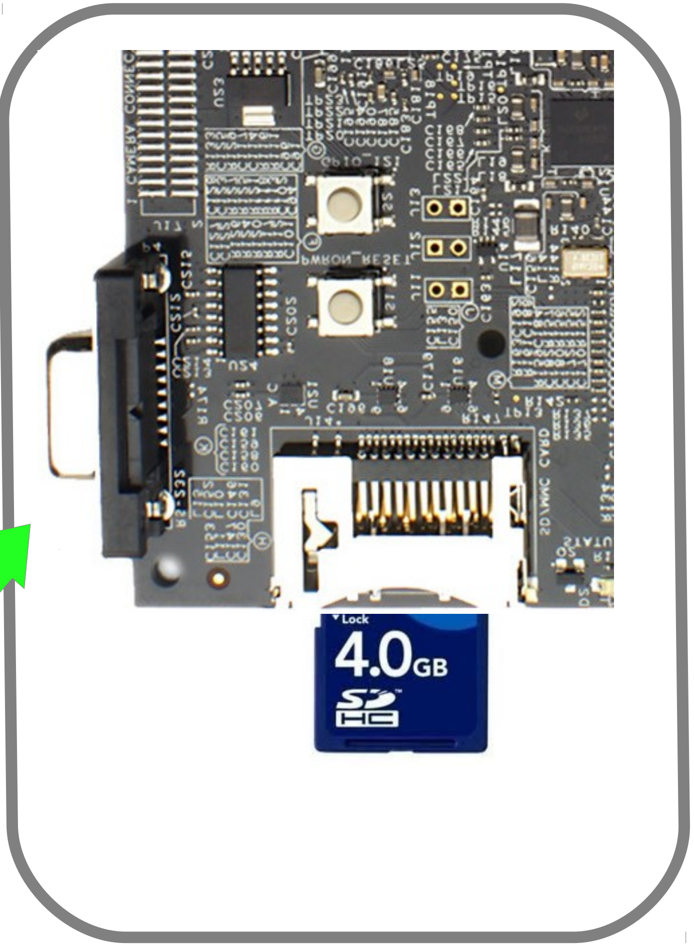
G1 Bring Up

Plug the SD Card Into the Target



Here
:)

Also plug in a
Serial to USB
Cable!!!

Proof

Step 1: Go to Settings > About tablet

Step 2: Look at “Kernel version”

Ha! Prove it!

Change the Kernel's Config

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    Rebuild the Kernel

< android-build Build Naming

Change the Kernel's Config

  Debugging the Kernel and User Space at the Same Time
  Native Debugging with ARM's DS-5 Community Edition
G1 Bring Up

Set CONFIG options for KGDB

```
[ ]  1. Set CONFIG_EXPERIMENTAL to y
[ ]  2. Set CONFIG_DEBUG_INFO to y
[ ]  3. Set CONFIG_FRAME_POINTER to y
[ ]  4. Set CONFIG_DEBUG_RODATA to y
[ ]  5. Set CONFIG_KGDB to y
```

Set CONFIG options for KGDB

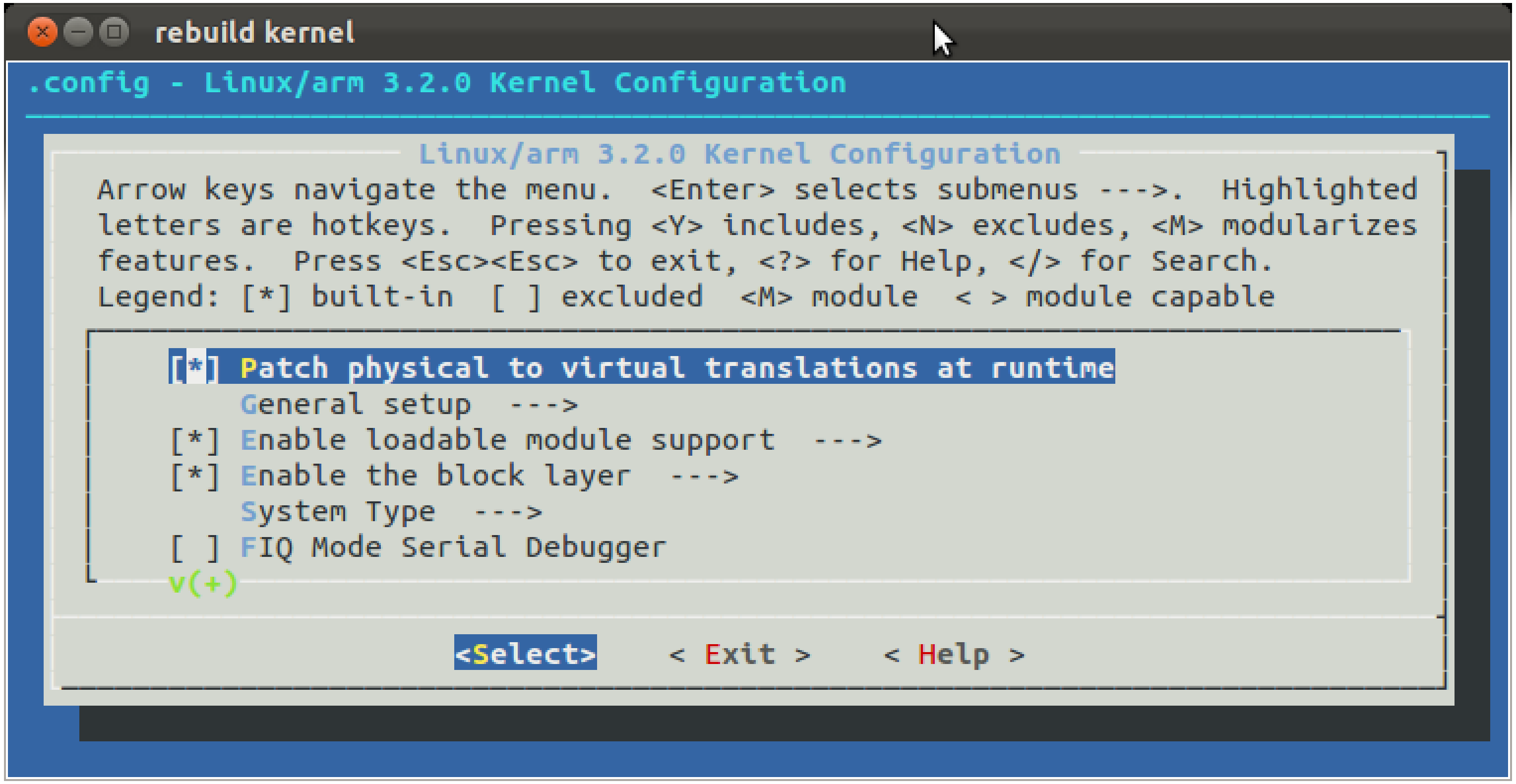
```
cd kernel

cp ../out/.config ../out/origconfig

make O=../out ARCH=arm menuconfig
```

The kernel is full of Documentation in tree.

```
sudo apt-get install docbook-utils
sudo apt-get install xmlto
make htmldocs
```

Its here too: http://www.kernel.org/doc/htmldocs/

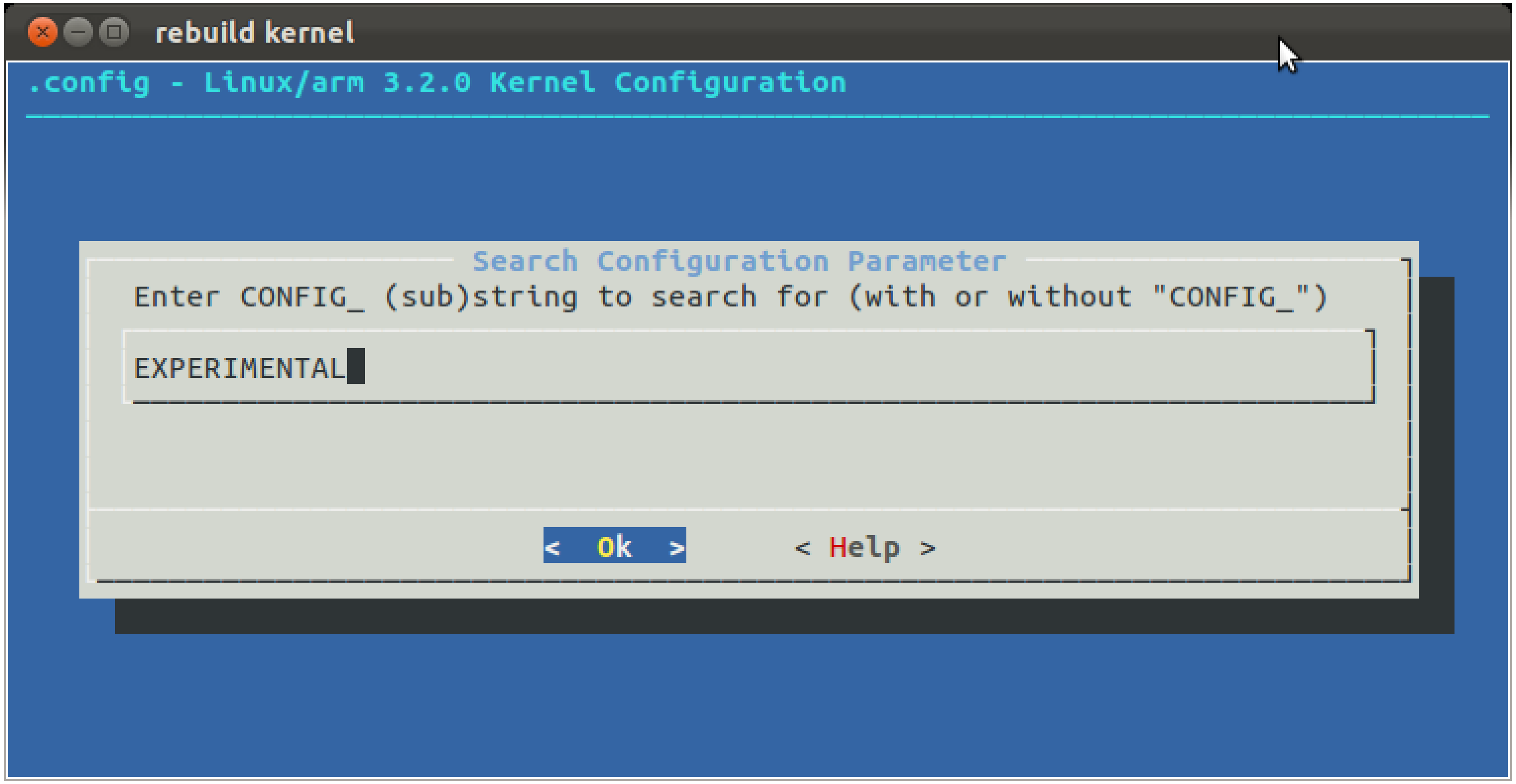
Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration
                    Linux/arm 3.2.0 Kernel Configuration
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.
  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

        [*] Patch physical to virtual translations at runtime
            General setup  --->
        [*] Enable loadable module support  --->
        [*] Enable the block layer  --->
            System Type  --->
        [ ] FIQ Mode Serial Debugger
        v(+)

                  <Select>    < Exit >    < Help >
```

Press / then type the string that comes after CONFIG_ to find where an option is,

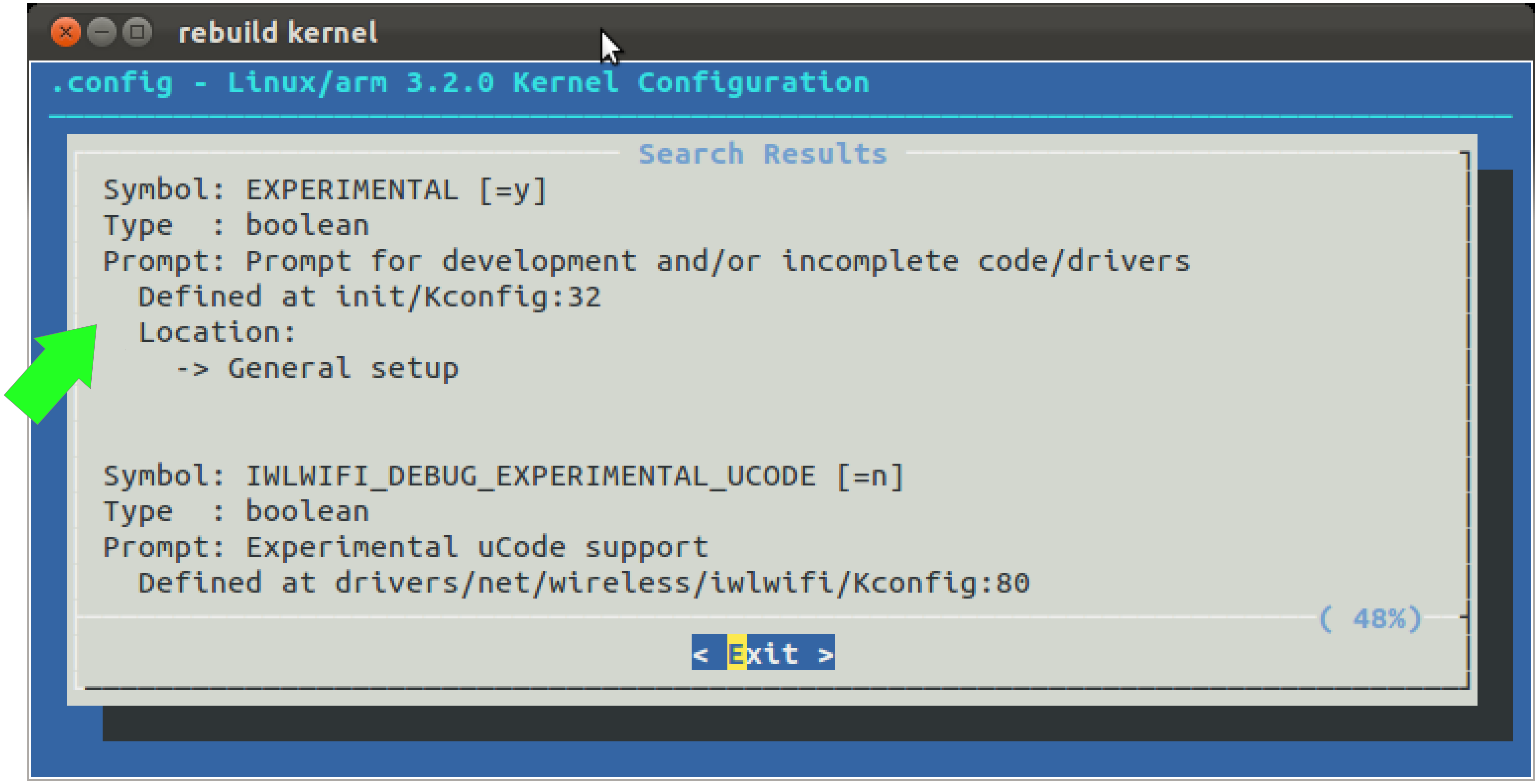
Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration

Search Configuration Parameter
Enter CONFIG_ (sub)string to search for (with or without "CONFIG_")

EXPERIMENTAL
```

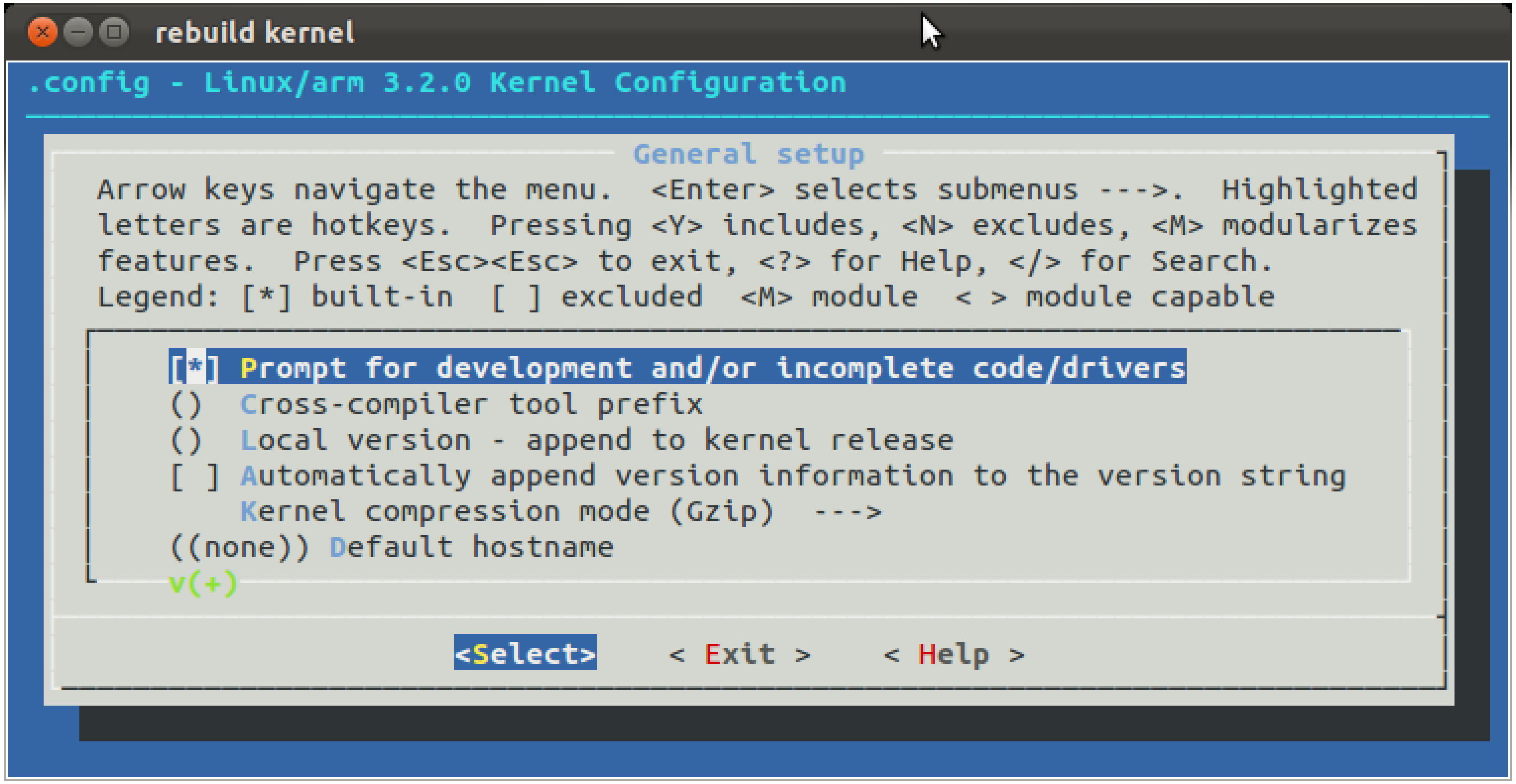
Cool eh?

Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration

                       Search Results
 Symbol: EXPERIMENTAL [=y]
 Type  : boolean
 Prompt: Prompt for development and/or incomplete code/drivers
   Defined at init/Kconfig:32
   Location:
     -> General setup


 Symbol: IWLWIFI_DEBUG_EXPERIMENTAL_UCODE [=n]
 Type  : boolean
 Prompt: Experimental uCode support
   Defined at drivers/net/wireless/iwlwifi/Kconfig:80
                                                      ( 48%)
                          < Exit >
```

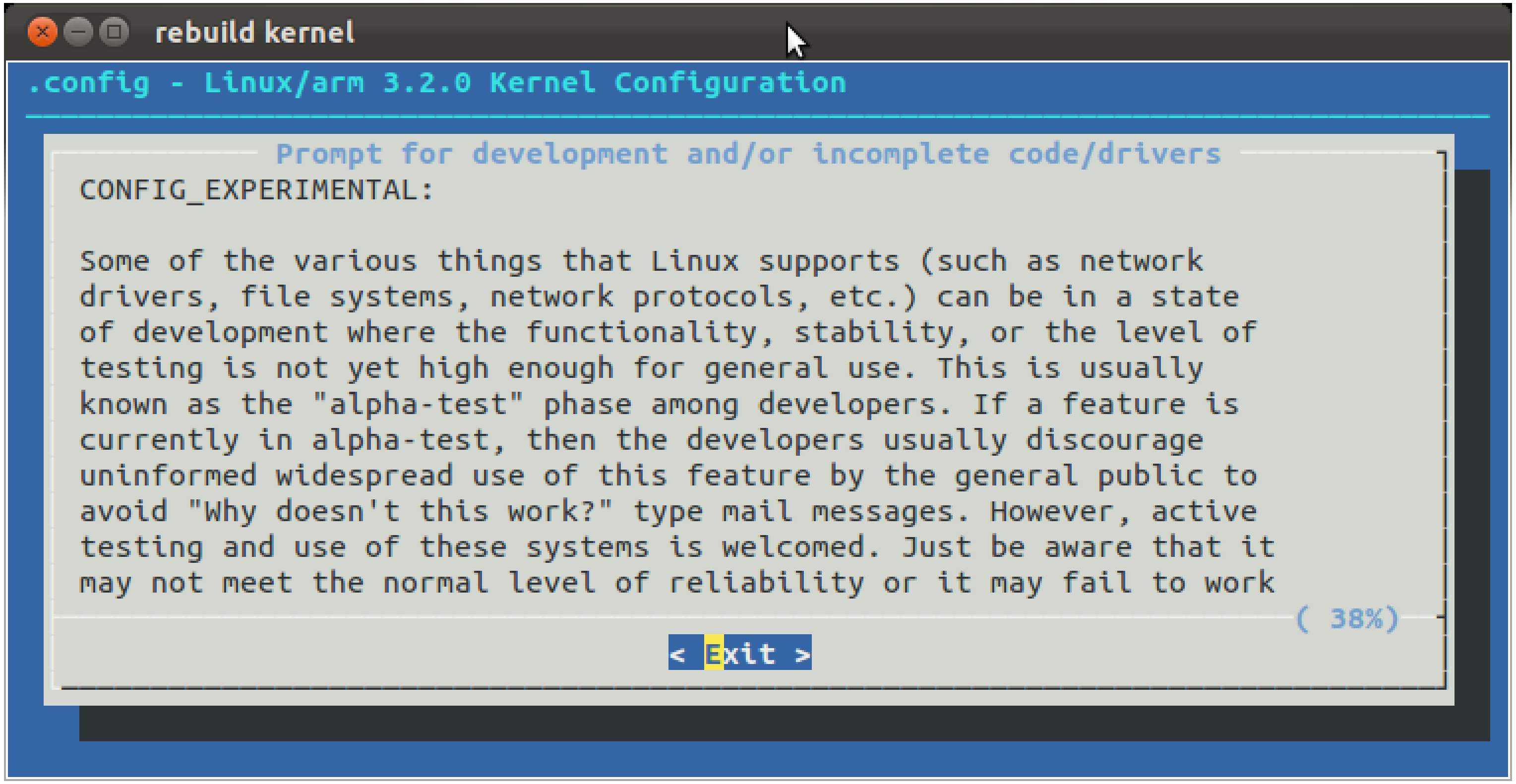
Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration

                              General setup
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.
  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

      [*] Prompt for development and/or incomplete code/drivers
      ()  Cross-compiler tool prefix
      ()  Local version - append to kernel release
      [ ] Automatically append version information to the version string
          Kernel compression mode (Gzip)  --->
      ((none)) Default hostname
      v(+)

                  <Select>    < Exit >    < Help >
```

Now press H

Set CONFIG options for KGDB



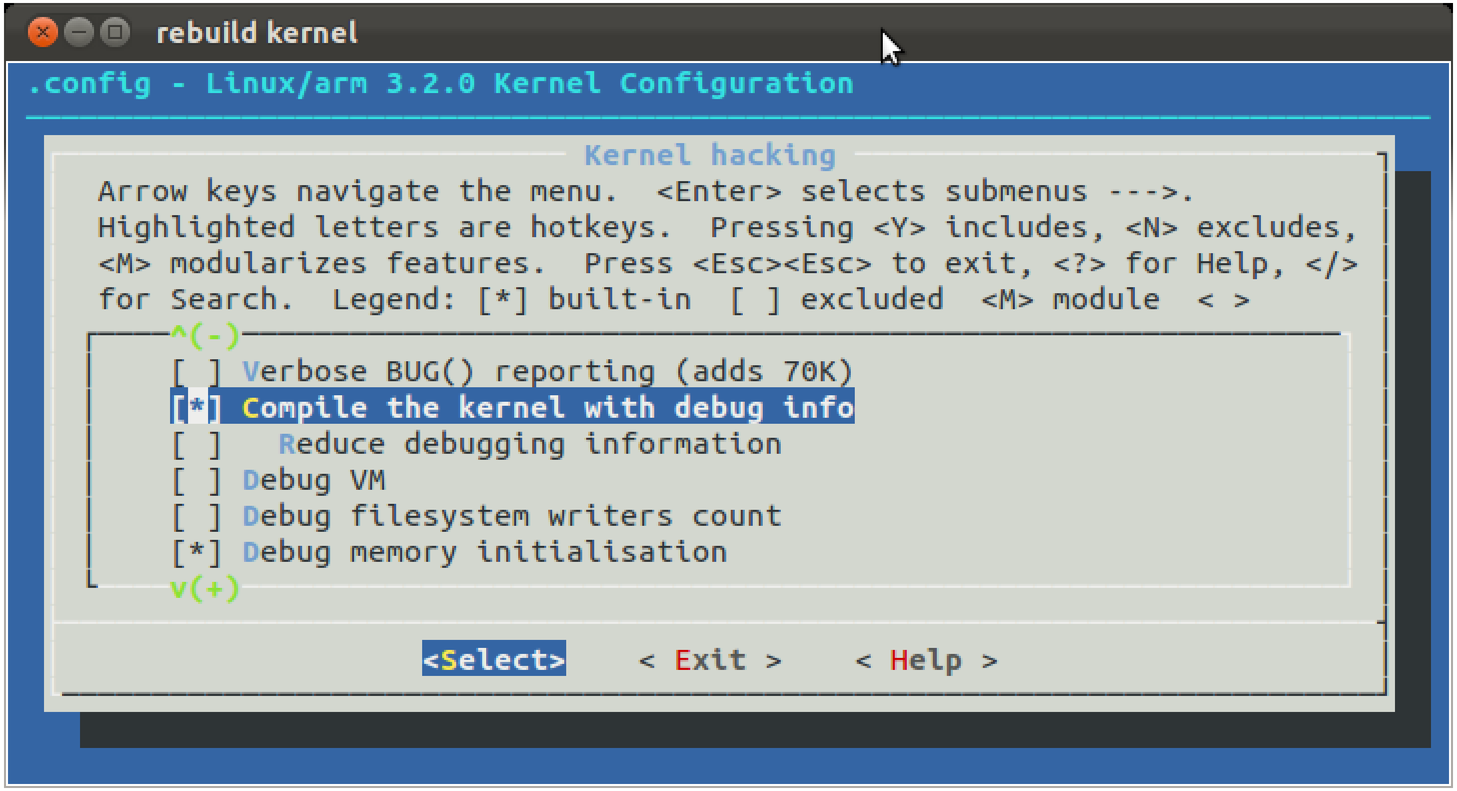
```
.config - Linux/arm 3.2.0 Kernel Configuration

         Prompt for development and/or incomplete code/drivers
CONFIG_EXPERIMENTAL:

Some of the various things that Linux supports (such as network
drivers, file systems, network protocols, etc.) can be in a state
of development where the functionality, stability, or the level of
testing is not yet high enough for general use. This is usually
known as the "alpha-test" phase among developers. If a feature is
currently in alpha-test, then the developers usually discourage
uninformed widespread use of this feature by the general public to
avoid "Why doesn't this work?" type mail messages. However, active
testing and use of these systems is welcomed. Just be aware that it
may not meet the normal level of reliability or it may fail to work
                                                           ( 38%)
                          < Exit >
```

Yup, the right one.

Set CONFIG options for KGDB

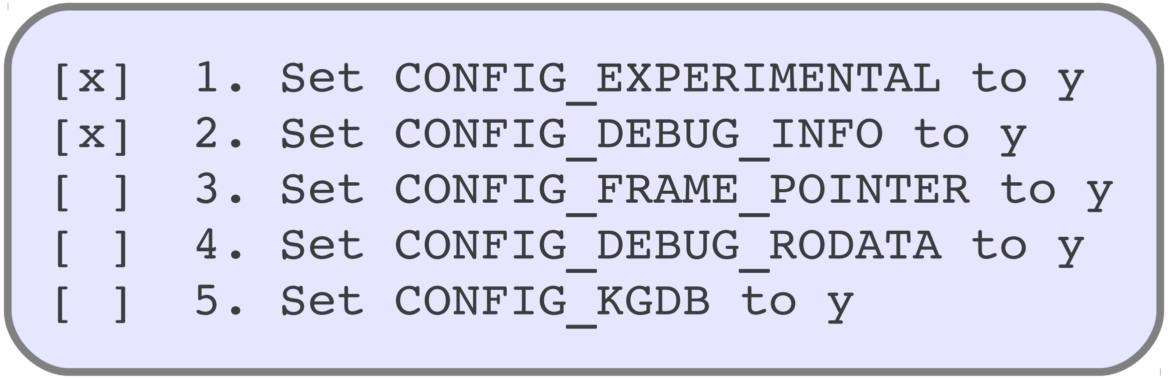
```
[x]  1. Set CONFIG_EXPERIMENTAL to y
[ ]  2. Set CONFIG_DEBUG_INFO to y
[ ]  3. Set CONFIG_FRAME_POINTER to y
[ ]  4. Set CONFIG_DEBUG_RODATA to y
[ ]  5. Set CONFIG_KGDB to y
```

Set CONFIG options for KGDB



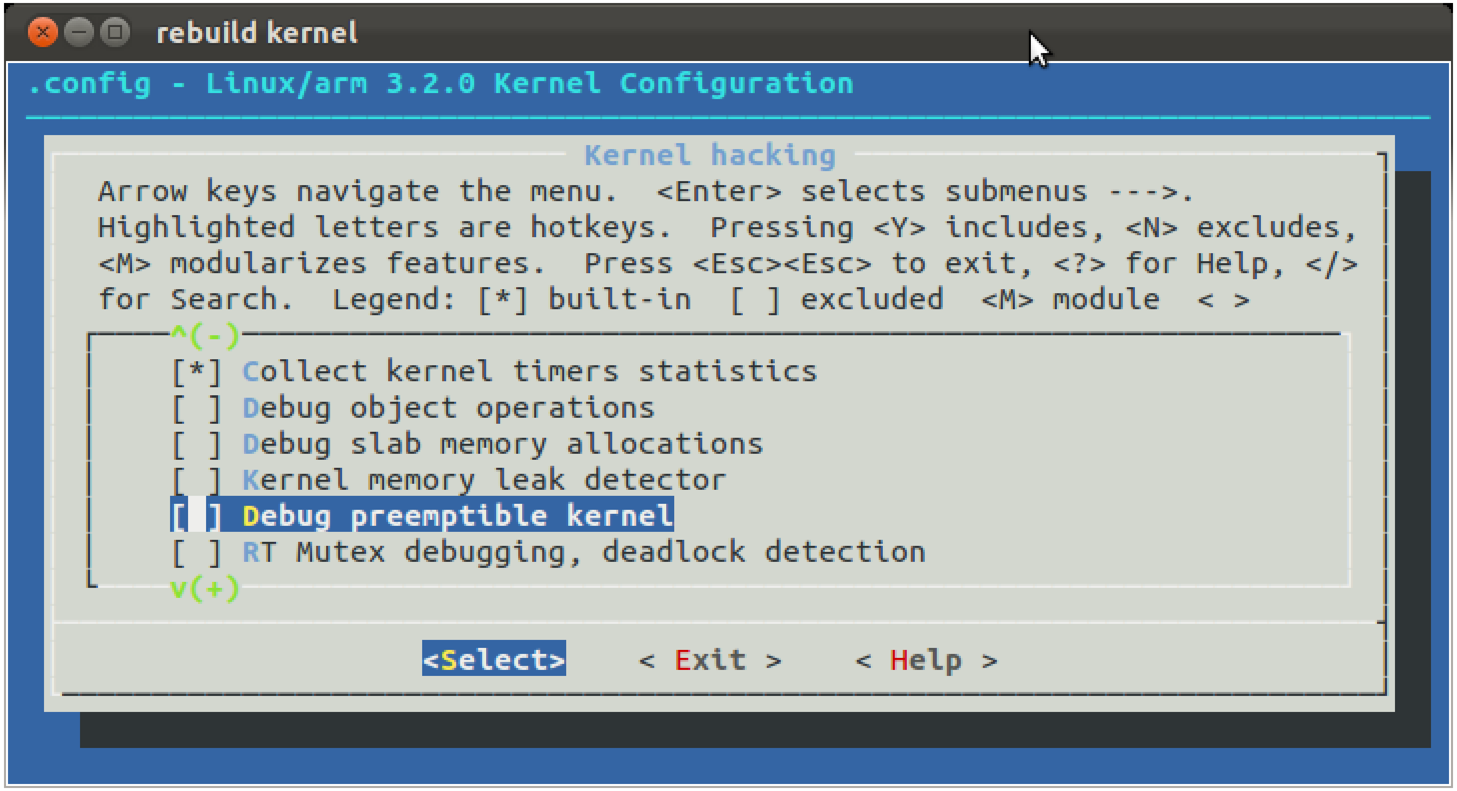
```
rebuild kernel
.config - Linux/arm 3.2.0 Kernel Configuration
                          Kernel hacking
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
        ^(-)
        [ ] Verbose BUG() reporting (adds 70K)
        [*] Compile the kernel with debug info
        [ ]   Reduce debugging information
        [ ] Debug VM
        [ ] Debug filesystem writers count
        [*] Debug memory initialisation
        v(+)

               <Select>    < Exit >    < Help >
```

Set CONFIG options for KGDB



```
[x]  1. Set CONFIG_EXPERIMENTAL to y
[x]  2. Set CONFIG_DEBUG_INFO to y
[ ]  3. Set CONFIG_FRAME_POINTER to y
[ ]  4. Set CONFIG_DEBUG_RODATA to y
[ ]  5. Set CONFIG_KGDB to y
```

Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration

                      Kernel hacking
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
     ^(-)
       [*] Collect kernel timers statistics
       [ ] Debug object operations
       [ ] Debug slab memory allocations
       [ ] Kernel memory leak detector
       [ ] Debug preemptible kernel
       [ ] RT Mutex debugging, deadlock detection
     v(+)

             <Select>    < Exit >    < Help >
```

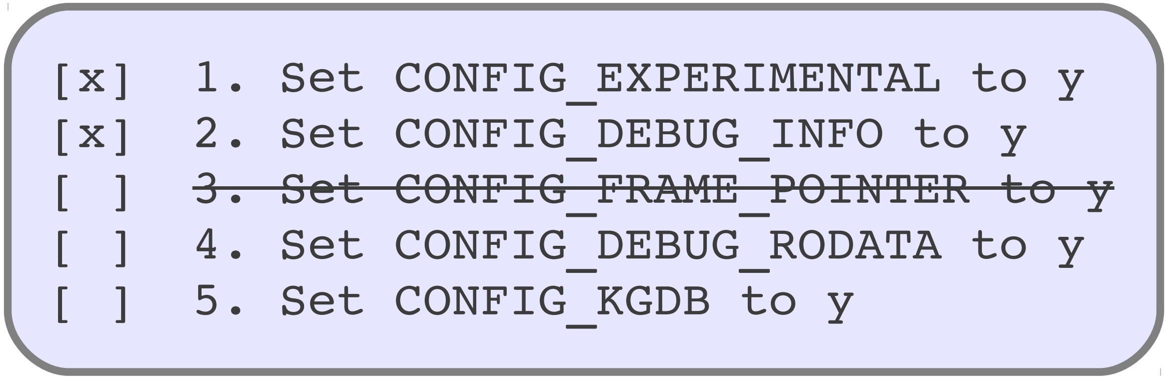
Hmmm, I've scrolled up and down. Where is it? Lets see, / FRAME_POINTER

Set CONFIG options for KGDB

```
Symbol: FRAME_POINTER [=n]
Type  : boolean
Prompt: Compile the kernel with frame pointers
  Defined at lib/Kconfig.debug:847
  Depends on: DEBUG_KERNEL [=y]
              && (CRIS || M68K || FRV || UML || AVR32 ||
                  SUPERH || BLACKFIN ||  MN10300) ||
              ARCH_WANT_FRAME_POINTERS [=n]
   Location:
     -> Kernel hacking
   Selected by: LOCKDEP [=n] && DEBUG_KERNEL [=y] &&
                TRACE_IRQFLAGS_SUPPORT [=y] &&
                STACKTRACE_SUPPORT [=y] && LOCKDEP_SUPPORT [=y] && !MIPS


  Symbol: ARCH_WANT_FRAME_POINTERS [=n]
```

Hmmm...can't select it because my architecture isn't supported. Bummer

Set CONFIG options for KGDB



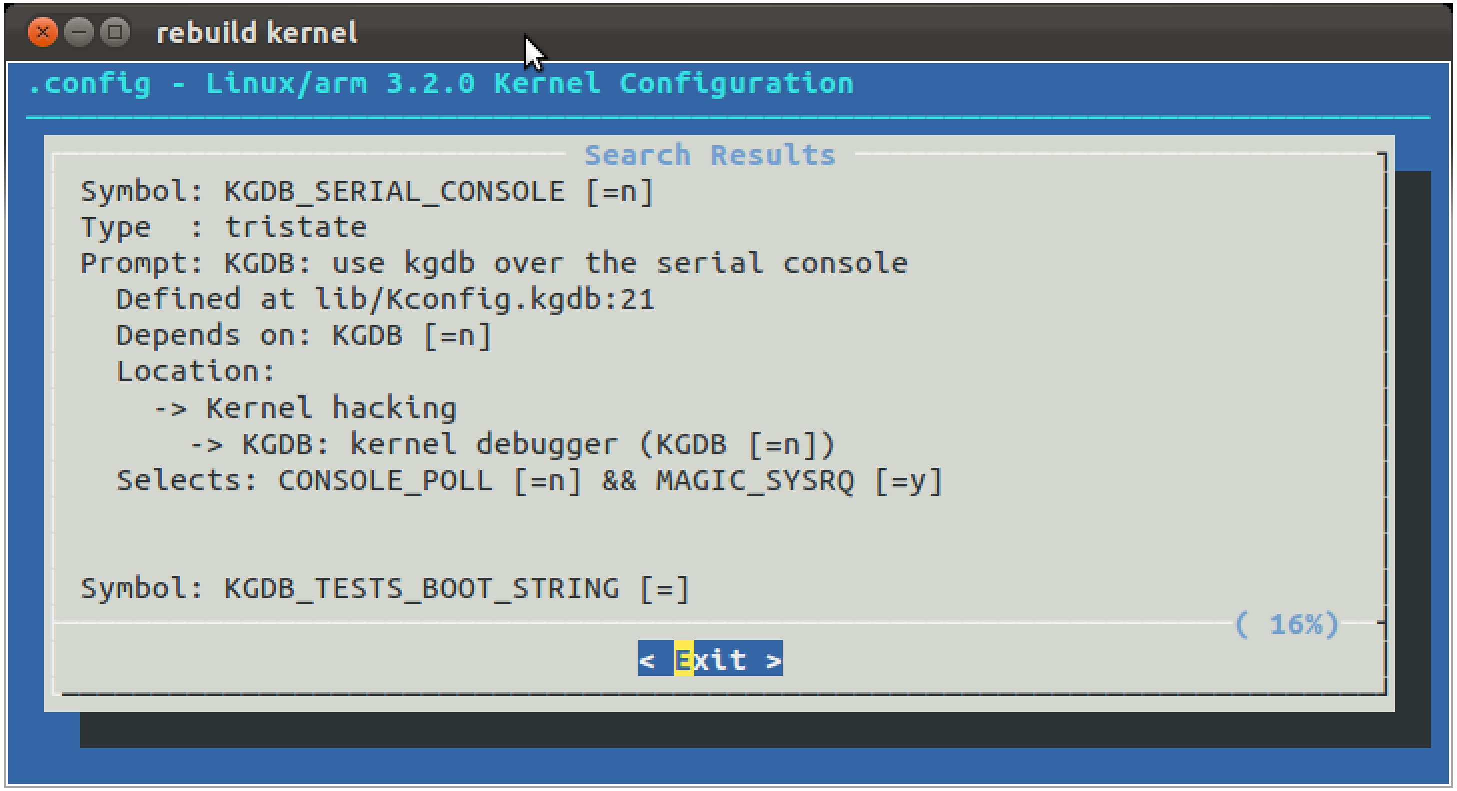
```
[x]  1. Set CONFIG_EXPERIMENTAL to y
[x]  2. Set CONFIG_DEBUG_INFO to y
[ ]  ~~3. Set CONFIG_FRAME_POINTER to y~~
[ ]  4. Set CONFIG_DEBUG_RODATA to y
[ ]  5. Set CONFIG_KGDB to y
```

Set CONFIG options for KGDB

[x] 1. Set CONFIG_EXPERIMENTAL to y
[x] 2. Set CONFIG_DEBUG_INFO to y
[ ] ~~3. Set CONFIG_FRAME_POINTER to y~~
[ ] ~~4. Set CONFIG_DEBUG_RODATA to y~~
[ ] 5. Set CONFIG_KGDB to y

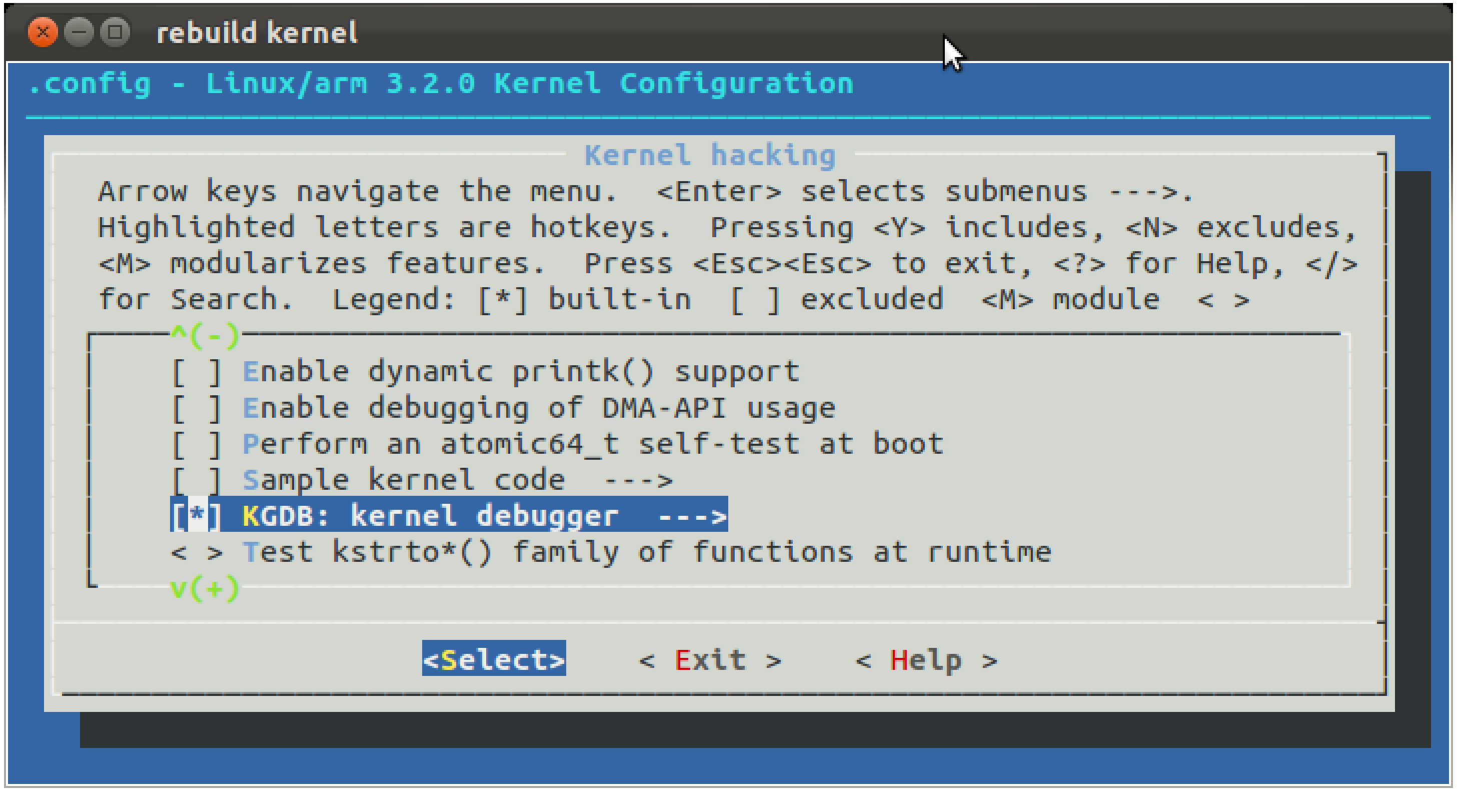
Hmmm... not even in search.

Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration

                         Search Results
Symbol: KGDB_SERIAL_CONSOLE [=n]
Type  : tristate
Prompt: KGDB: use kgdb over the serial console
  Defined at lib/Kconfig.kgdb:21
  Depends on: KGDB [=n]
  Location:
    -> Kernel hacking
      -> KGDB: kernel debugger (KGDB [=n])
  Selects: CONSOLE_POLL [=n] && MAGIC_SYSRQ [=y]


Symbol: KGDB_TESTS_BOOT_STRING [=]
                                                        ( 16%)
                         < Exit >
```

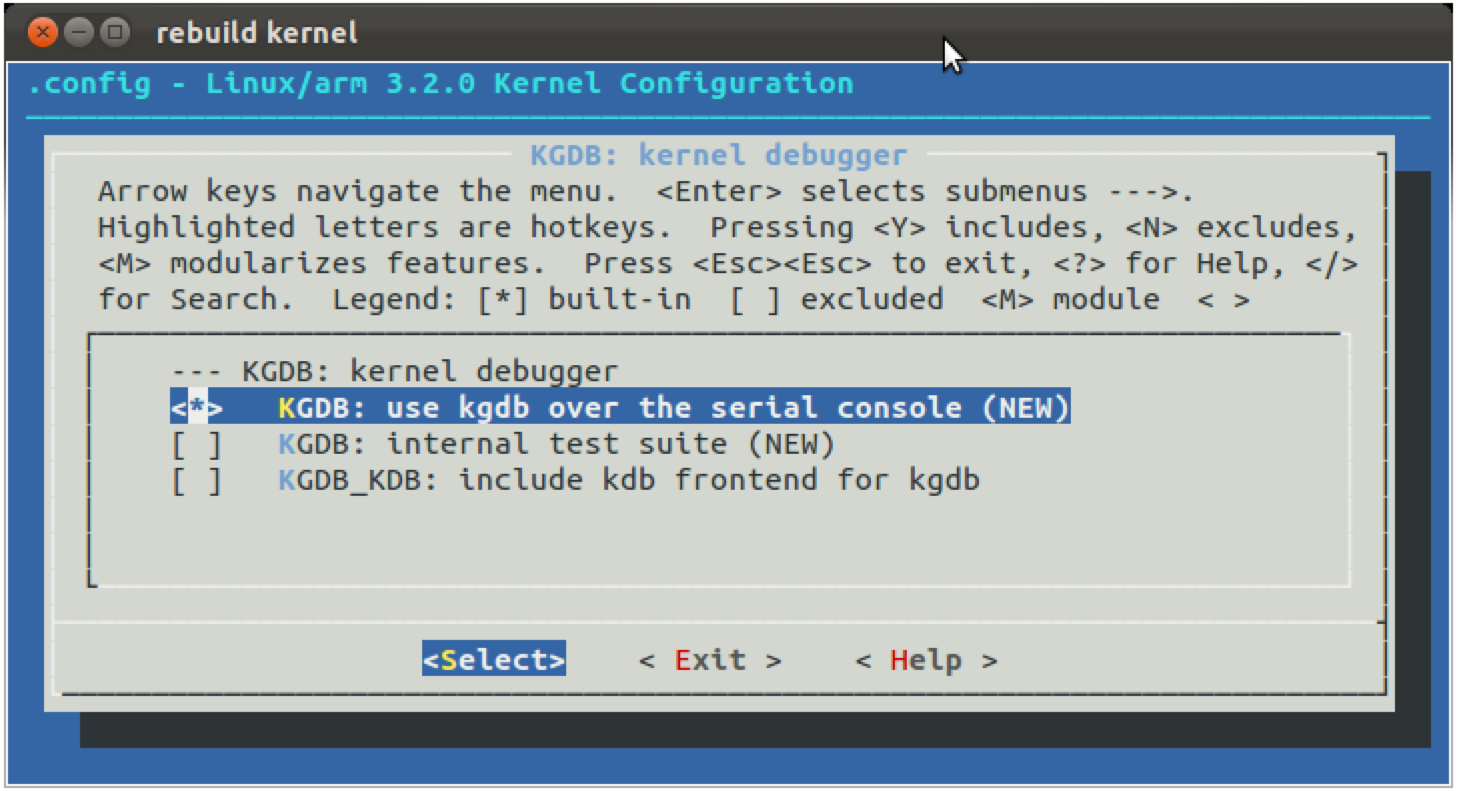
Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration
                              Kernel hacking
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >
      ^(-)
      [ ] Enable dynamic printk() support
      [ ] Enable debugging of DMA-API usage
      [ ] Perform an atomic64_t self-test at boot
      [ ] Sample kernel code  --->
      [*] KGDB: kernel debugger  --->
      < > Test kstrto*() family of functions at runtime
      v(+)

                  <Select>    < Exit >    < Help >
```

Hmmm... more config options...

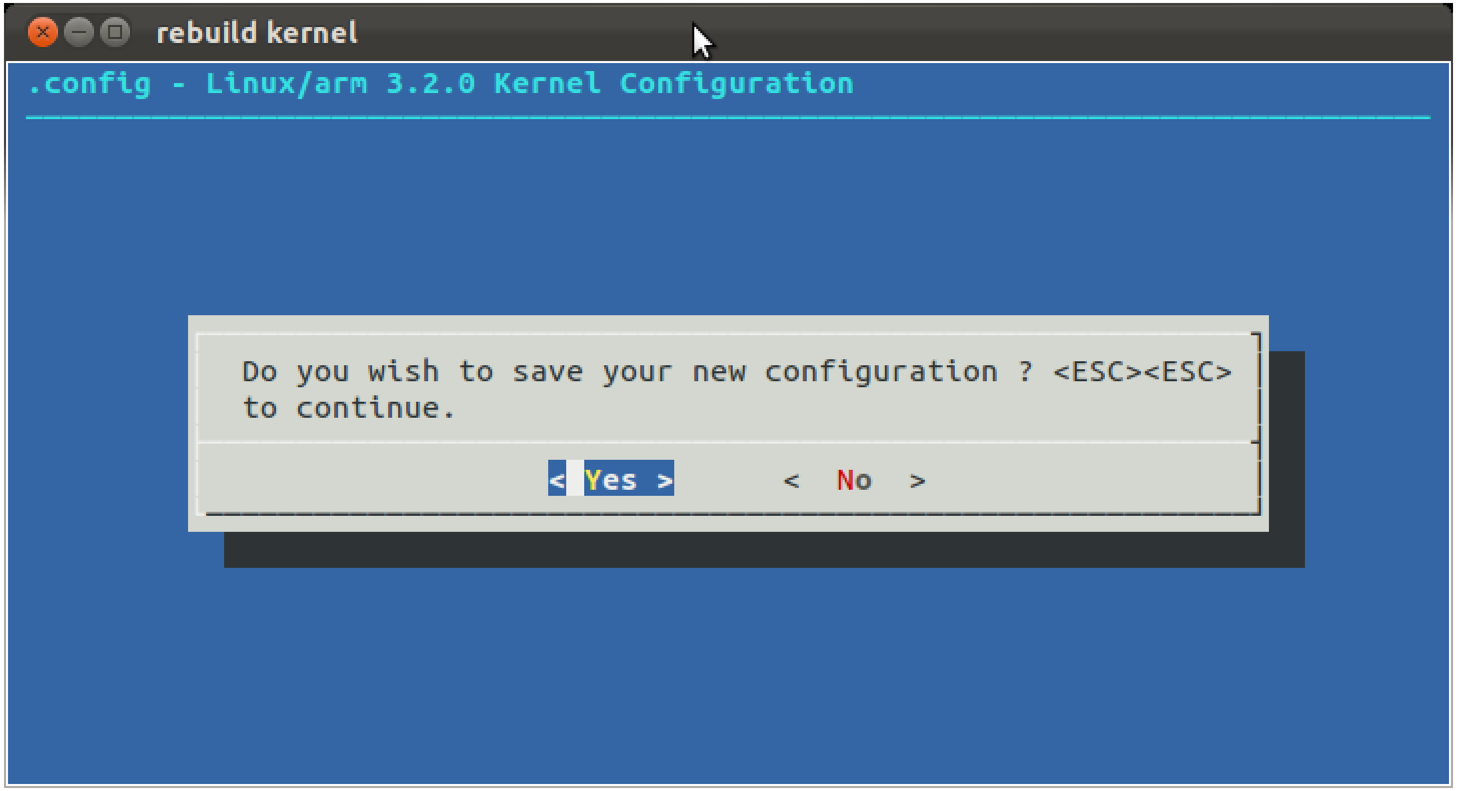
Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration

                    KGDB: kernel debugger
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

      --- KGDB: kernel debugger
      <*>    KGDB: use kgdb over the serial console (NEW)
      [ ]    KGDB: internal test suite (NEW)
      [ ]    KGDB_KDB: include kdb frontend for kgdb

                 <Select>    < Exit >    < Help >
```

Hmmm... don't need these.

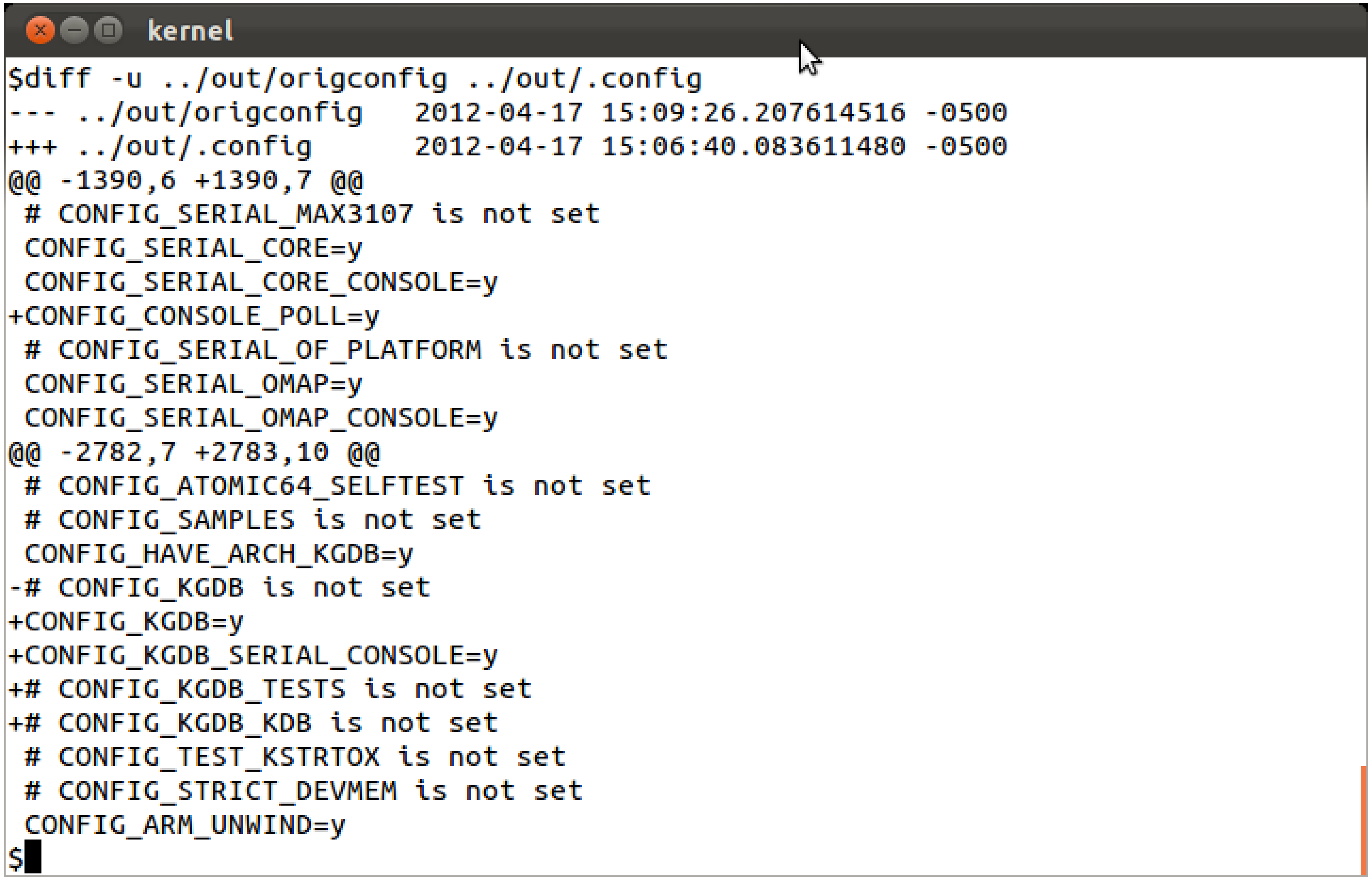
Set CONFIG options for KGDB



```
.config - Linux/arm 3.2.0 Kernel Configuration

  Do you wish to save your new configuration ? <ESC><ESC>
  to continue.

              < Yes >        <  No  >
```

Save the config... Exit, Exit, Exit, Y

Set CONFIG options for KGDB



```
$diff -u ../out/origconfig ../out/.config
--- ../out/origconfig   2012-04-17 15:09:26.207614516 -0500
+++ ../out/.config      2012-04-17 15:06:40.083611480 -0500
@@ -1390,6 +1390,7 @@
 # CONFIG_SERIAL_MAX3107 is not set
 CONFIG_SERIAL_CORE=y
 CONFIG_SERIAL_CORE_CONSOLE=y
+CONFIG_CONSOLE_POLL=y
 # CONFIG_SERIAL_OF_PLATFORM is not set
 CONFIG_SERIAL_OMAP=y
 CONFIG_SERIAL_OMAP_CONSOLE=y
@@ -2782,7 +2783,10 @@
 # CONFIG_ATOMIC64_SELFTEST is not set
 # CONFIG_SAMPLES is not set
 CONFIG_HAVE_ARCH_KGDB=y
-# CONFIG_KGDB is not set
+CONFIG_KGDB=y
+CONFIG_KGDB_SERIAL_CONSOLE=y
+# CONFIG_KGDB_TESTS is not set
+# CONFIG_KGDB_KDB is not set
 # CONFIG_TEST_KSTRTOX is not set
 # CONFIG_STRICT_DEVMEM is not set
 CONFIG_ARM_UNWIND=y
$
```

Check the config

Use Kernel with New Config

```
cd kernel

export CROSS_COMPILE=/workspace/androids/panda-ics-gcc46-tilt-tracking-blob/rebuild_kernel/android-toolchain-eabi/bin/arm-linux-androideabi-

make O=../out ARCH=arm CROSS_COMPILE=${CROSS_COMPILE} uImage modules

cd android

mkdir mnt

sudo mount /dev/sdc1 mnt

ls mnt

sudo cp ../rebuild_kernel/out/arch/arm/boot/uImage mnt

sudo umount mnt

sync
```

Rebuild and copy uImage to the SD card. Make sure to boot the image before the next steps

Update Boot Args

boot-scr-extract.sh

```
#!/bin/sh

mkdir mnt
sudo mount $1 mnt
dd if=mnt/boot.scr of=boot.txt bs=1 skip=72
sync
sudo umount mnt
rmdir mnt
```

Update Boot Args

boot-scr-write.sh

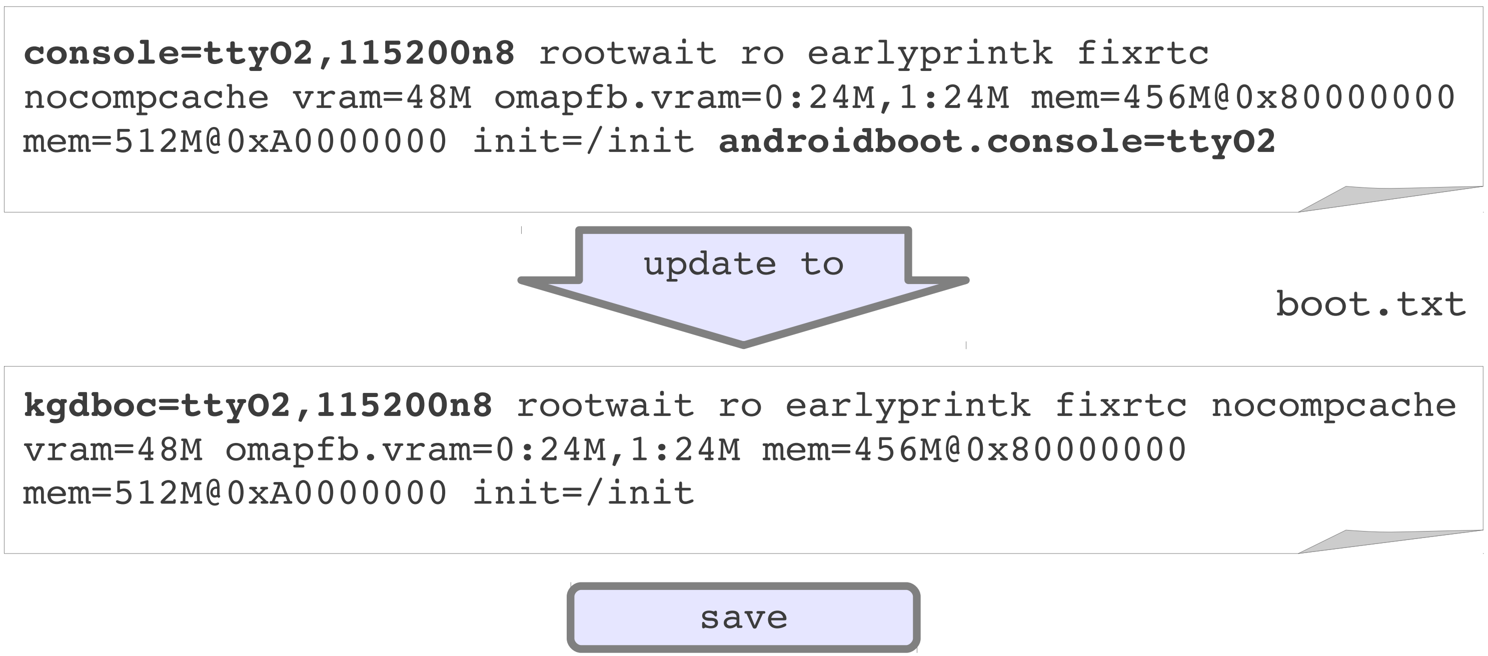
```
#!/bin/sh

mkdir mnt
sudo mount $1 mnt
sudo mkimage -C none -T \
                script -a 0 -e 0 -n \
                script -d boot.txt mnt/boot.scr
sync
sudo umount mnt
rmdir mnt
```

Update Boot Args

```
./boot-scr-extract.sh /dev/sdc1
```

```
emacs boot.txt
```

boot.txt



```
console=ttyO2,115200n8 rootwait ro earlyprintk fixrtc
nocompcache vram=48M omapfb.vram=0:24M,1:24M mem=456M@0x80000000
mem=512M@0xA0000000 init=/init androidboot.console=ttyO2
```

boot.txt

```
kgdboc=ttyO2,115200n8 rootwait ro earlyprintk fixrtc nocompcache
vram=48M omapfb.vram=0:24M,1:24M mem=456M@0x80000000
mem=512M@0xA0000000 init=/init
```

```
./boot-scr-write.sh /dev/sdc1
```

Prepare to Boot

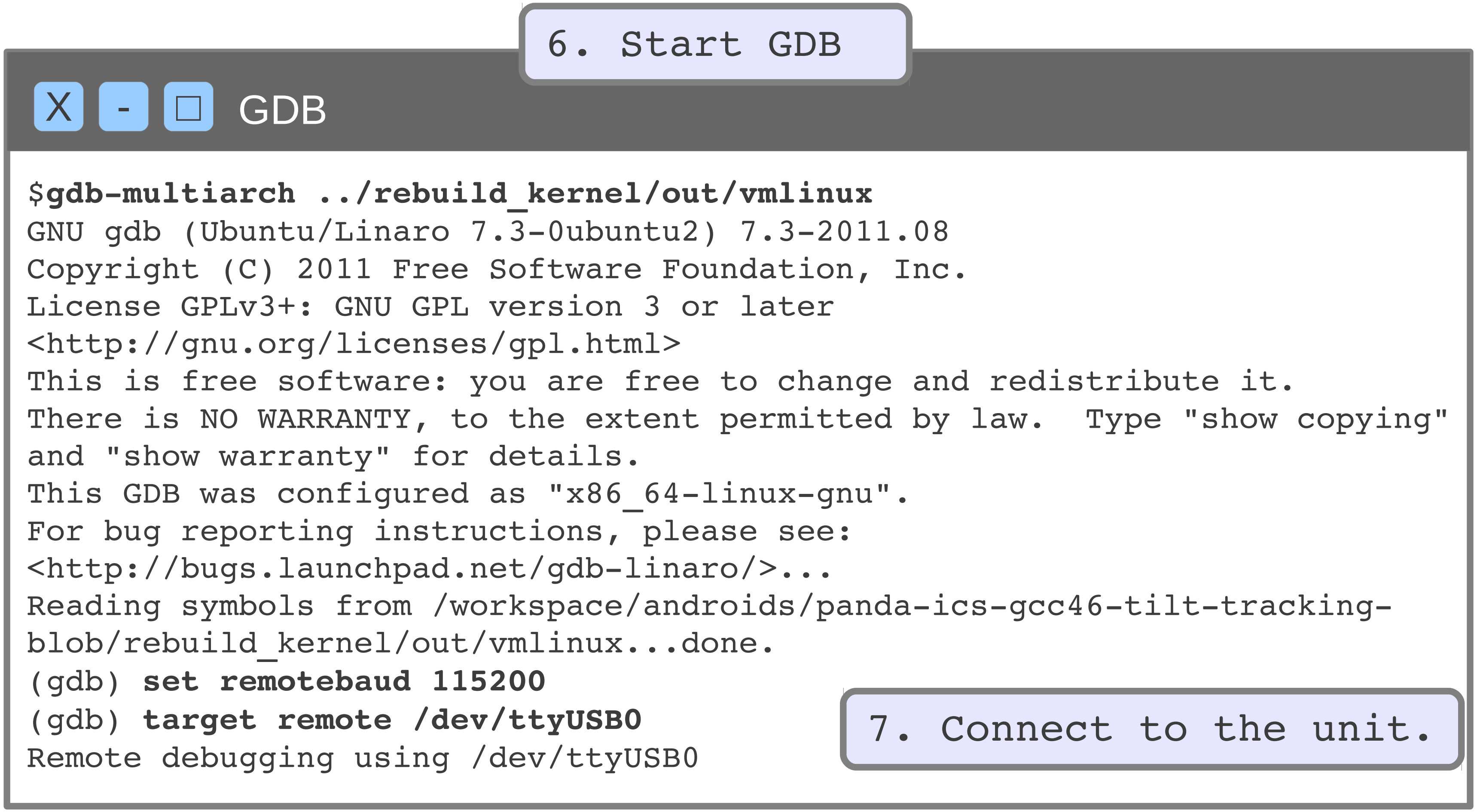
```
1. Connect to serial
2. Connect ADB over USB (or Ethernet)
3. Open terminal for GDB
4. Open terminal for ADB
```

Boot and Connect

```
5. Boot the unit
```

You won't see any console output because you changed the bootargs you passed to the kernel.

Boot and Connect



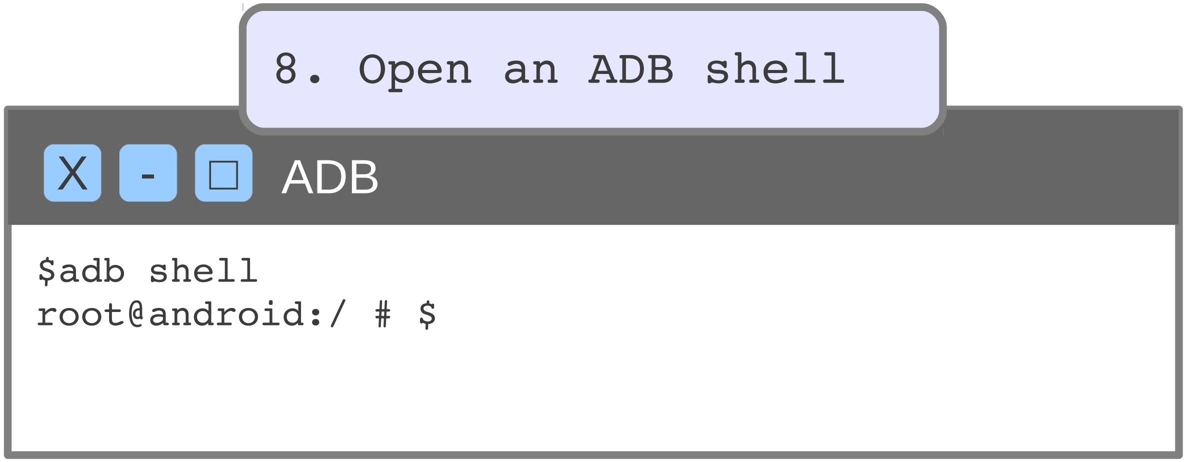
6. Start GDB

```
$gdb-multiarch ../rebuild_kernel/out/vmlinux
GNU gdb (Ubuntu/Linaro 7.3-0ubuntu2) 7.3-2011.08
Copyright (C) 2011 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later
<http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.  Type "show copying"
and "show warranty" for details.
This GDB was configured as "x86_64-linux-gnu".
For bug reporting instructions, please see:
<http://bugs.launchpad.net/gdb-linaro/>...
Reading symbols from /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/out/vmlinux...done.
(gdb) set remotebaud 115200
(gdb) target remote /dev/ttyUSB0
Remote debugging using /dev/ttyUSB0
```

7. Connect to the unit.

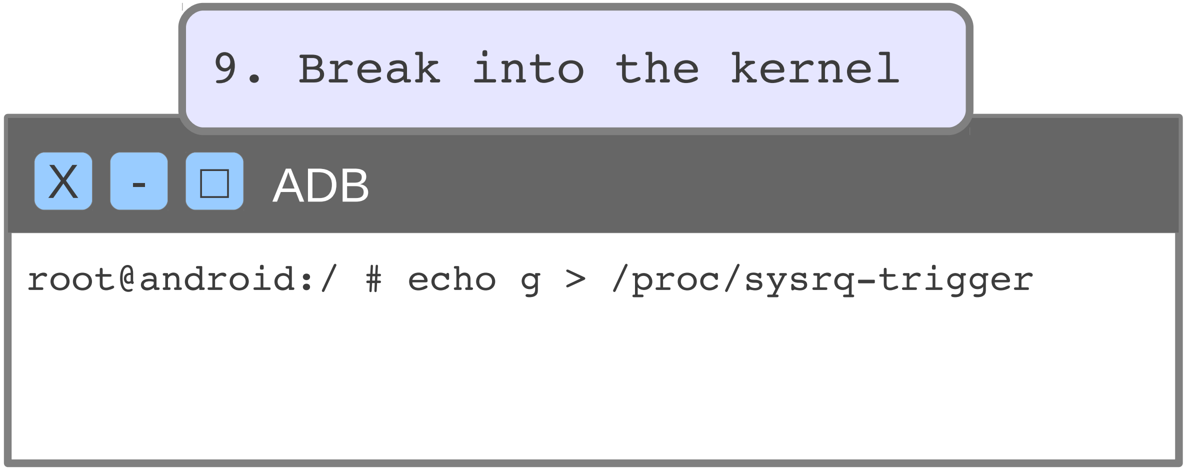
GDB will just sit there until to write to /proc/sysrq-trigger via ADB on the unit (see next step)

Boot and Connect



8. Open an ADB shell

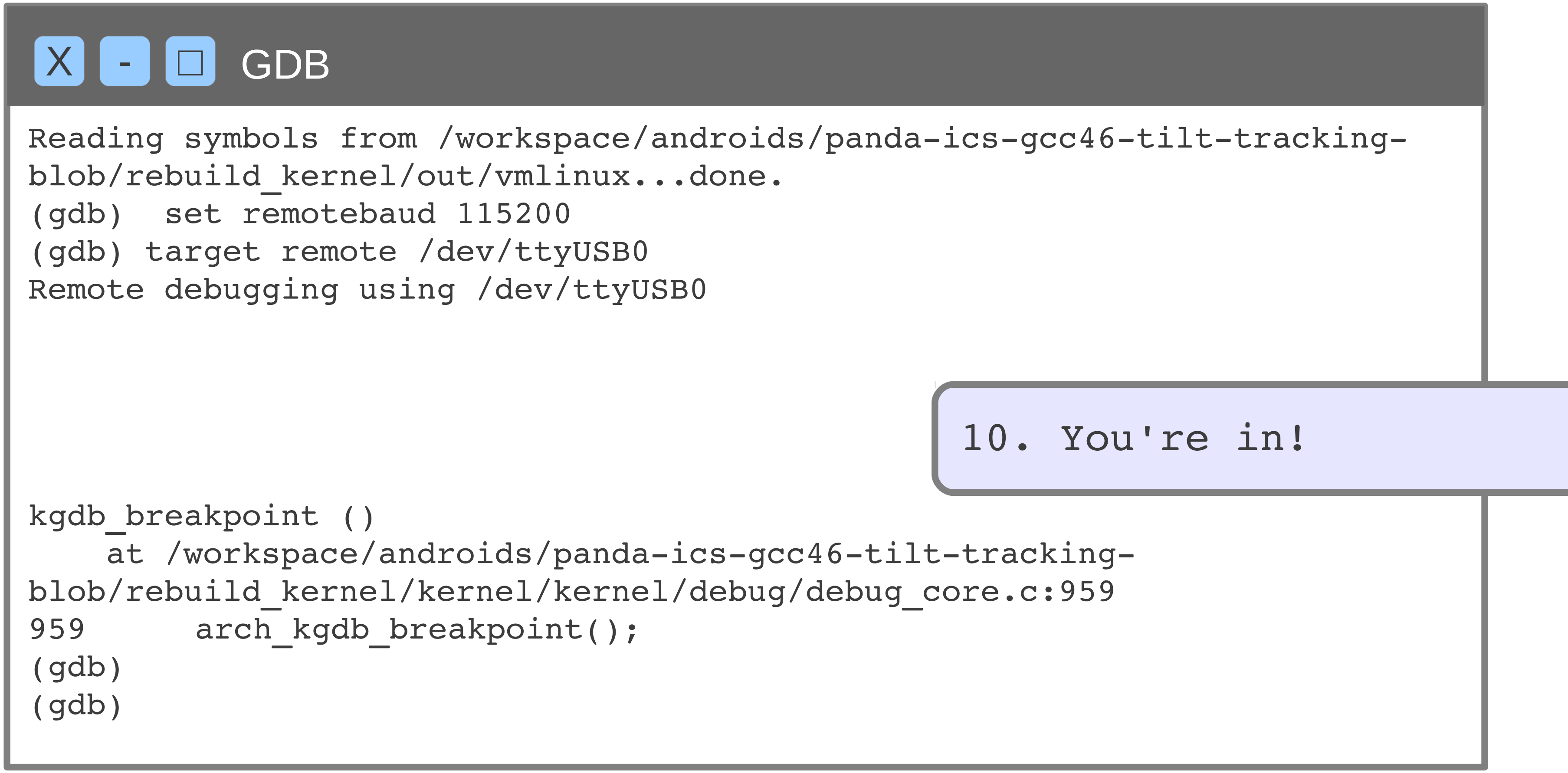
```
$adb shell
root@android:/ # $
```



9. Break into the kernel

```
root@android:/ # echo g > /proc/sysrq-trigger
```

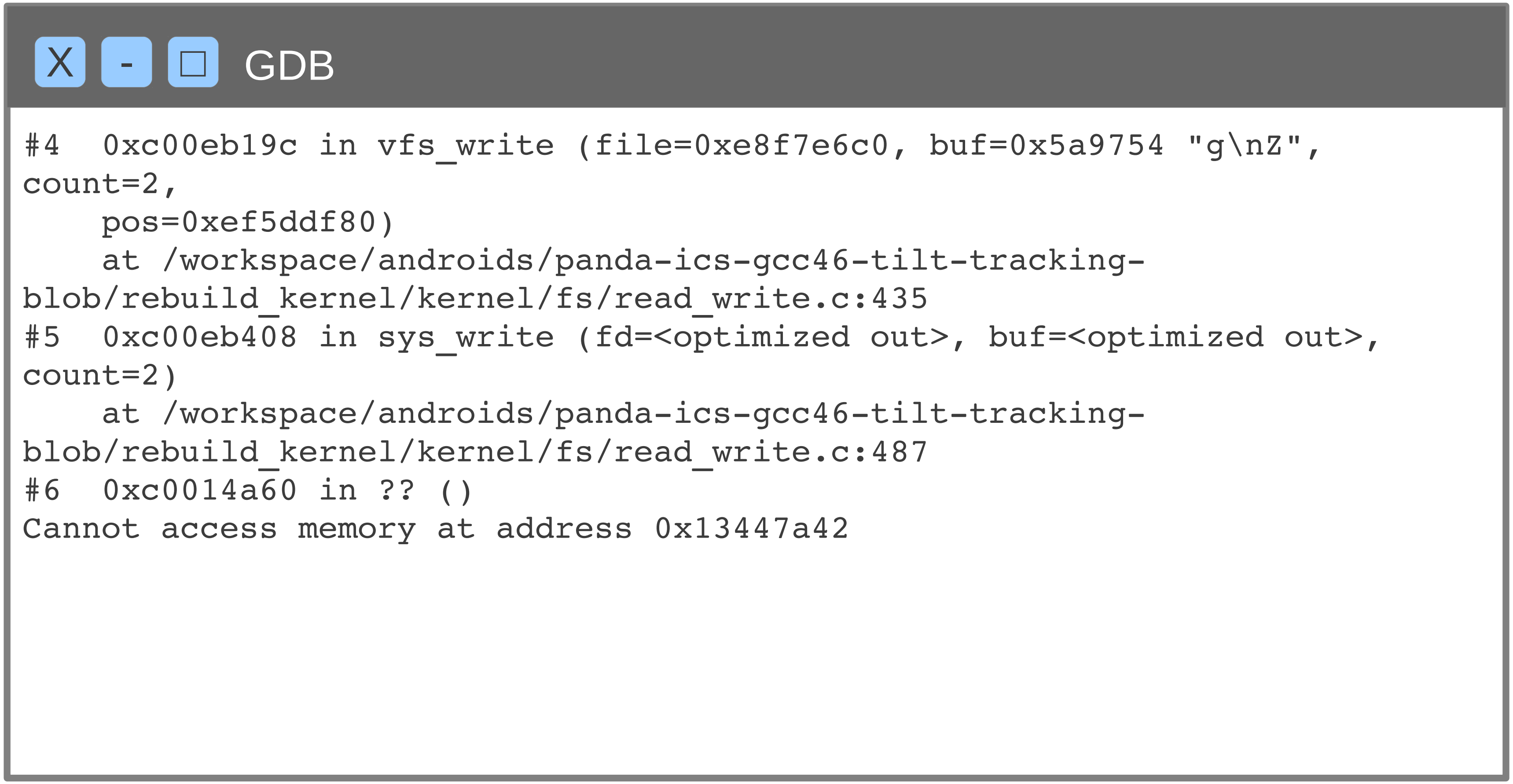
Boot and Connect



```
Reading symbols from /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/out/vmlinux...done.
(gdb)  set remotebaud 115200
(gdb) target remote /dev/ttyUSB0
Remote debugging using /dev/ttyUSB0




kgdb_breakpoint ()
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/debug/debug_core.c:959
959	arch_kgdb_breakpoint();
(gdb)
(gdb)
```

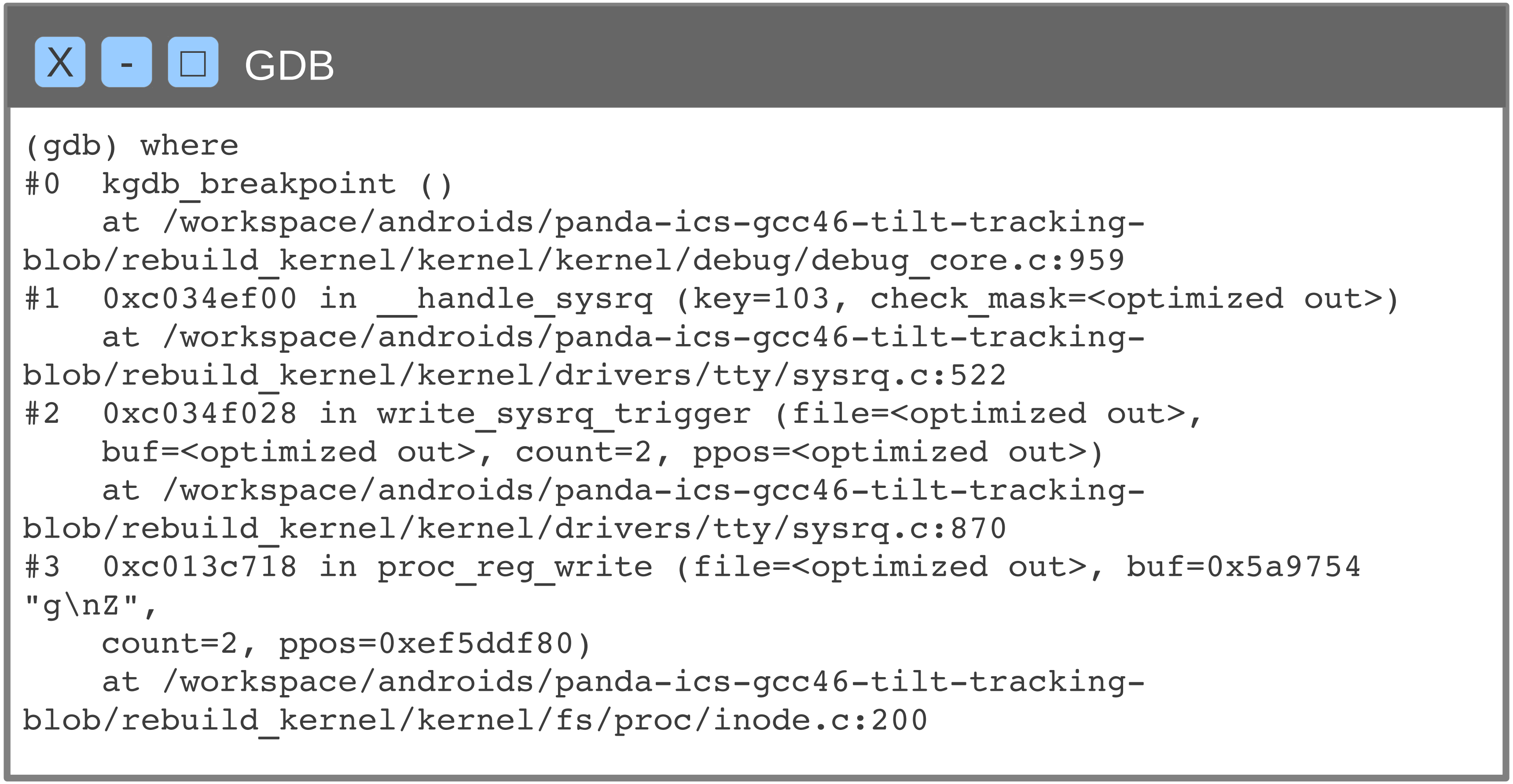
10. You're in!

where



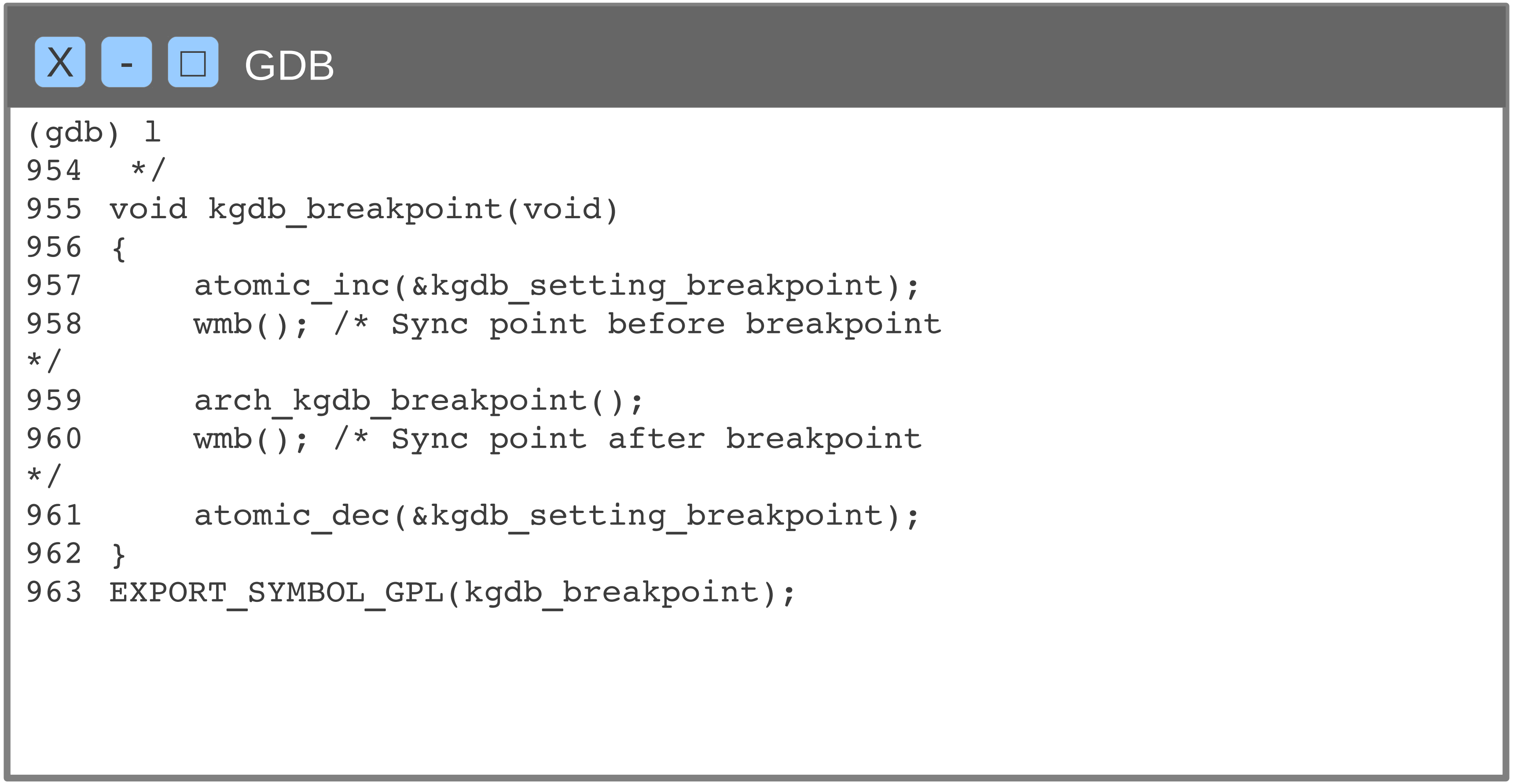
```
#4  0xc00eb19c in vfs_write (file=0xe8f7e6c0, buf=0x5a9754 "g\nZ",
count=2,
    pos=0xef5ddf80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:435
#5  0xc00eb408 in sys_write (fd=<optimized out>, buf=<optimized out>,
count=2)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:487
#6  0xc0014a60 in ?? ()
Cannot access memory at address 0x13447a42
```

where continued...



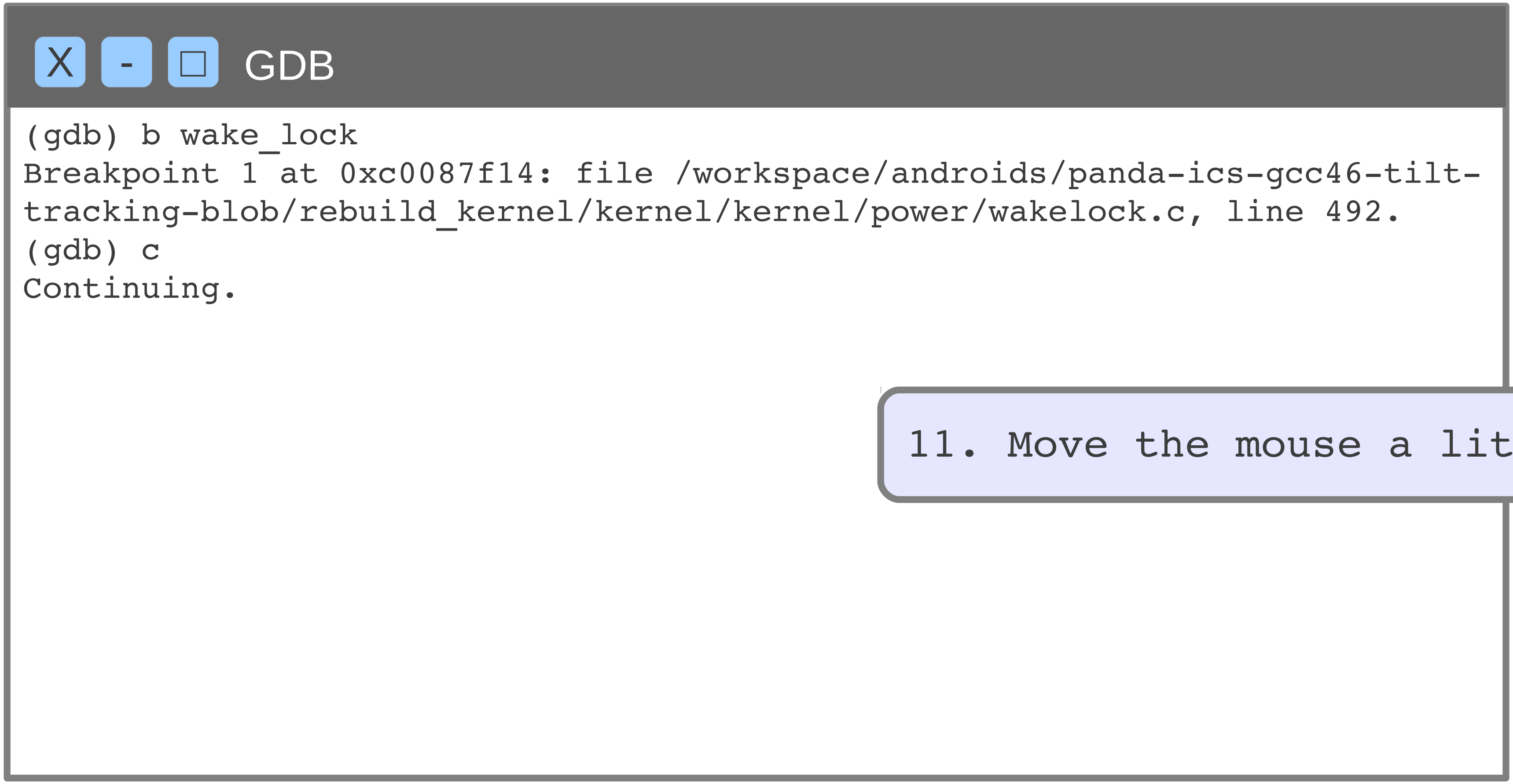
```
(gdb) where
#0  kgdb_breakpoint ()
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/debug/debug_core.c:959
#1  0xc034ef00 in __handle_sysrq (key=103, check_mask=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/drivers/tty/sysrq.c:522
#2  0xc034f028 in write_sysrq_trigger (file=<optimized out>,
    buf=<optimized out>, count=2, ppos=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/drivers/tty/sysrq.c:870
#3  0xc013c718 in proc_reg_write (file=<optimized out>, buf=0x5a9754
"g\nZ",
    count=2, ppos=0xef5ddf80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/proc/inode.c:200
```

l



```
(gdb) l
954   */
955  void kgdb_breakpoint(void)
956  {
957       atomic_inc(&kgdb_setting_breakpoint);
958       wmb(); /* Sync point before breakpoint
*/
959       arch_kgdb_breakpoint();
960       wmb(); /* Sync point after breakpoint
*/
961       atomic_dec(&kgdb_setting_breakpoint);
962  }
963  EXPORT_SYMBOL_GPL(kgdb_breakpoint);
```

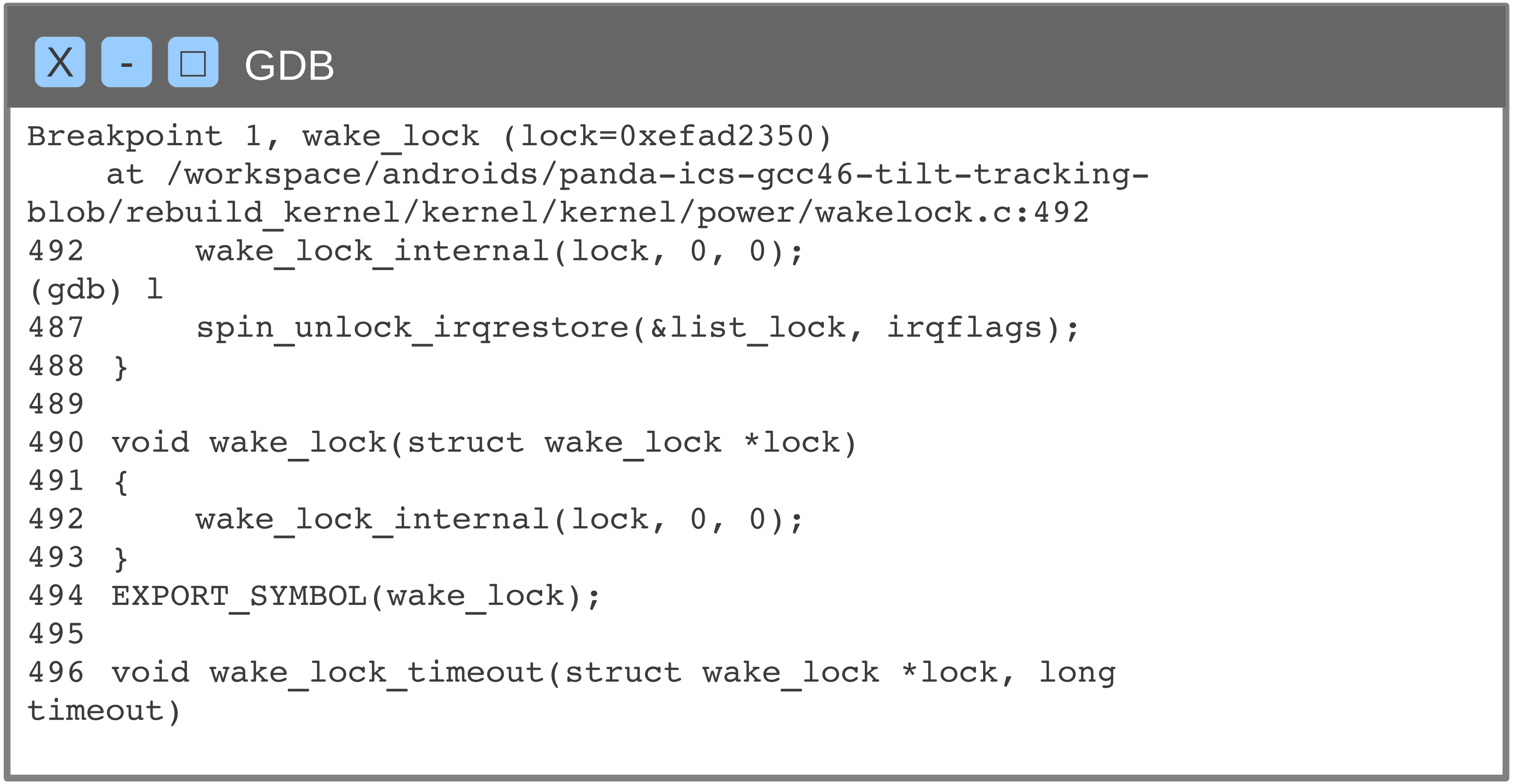
b wake_lock and c



```
(gdb) b wake_lock
Breakpoint 1 at 0xc0087f14: file /workspace/androids/panda-ics-gcc46-tilt-
tracking-blob/rebuild_kernel/kernel/kernel/power/wakelock.c, line 492.
(gdb) c
Continuing.
```

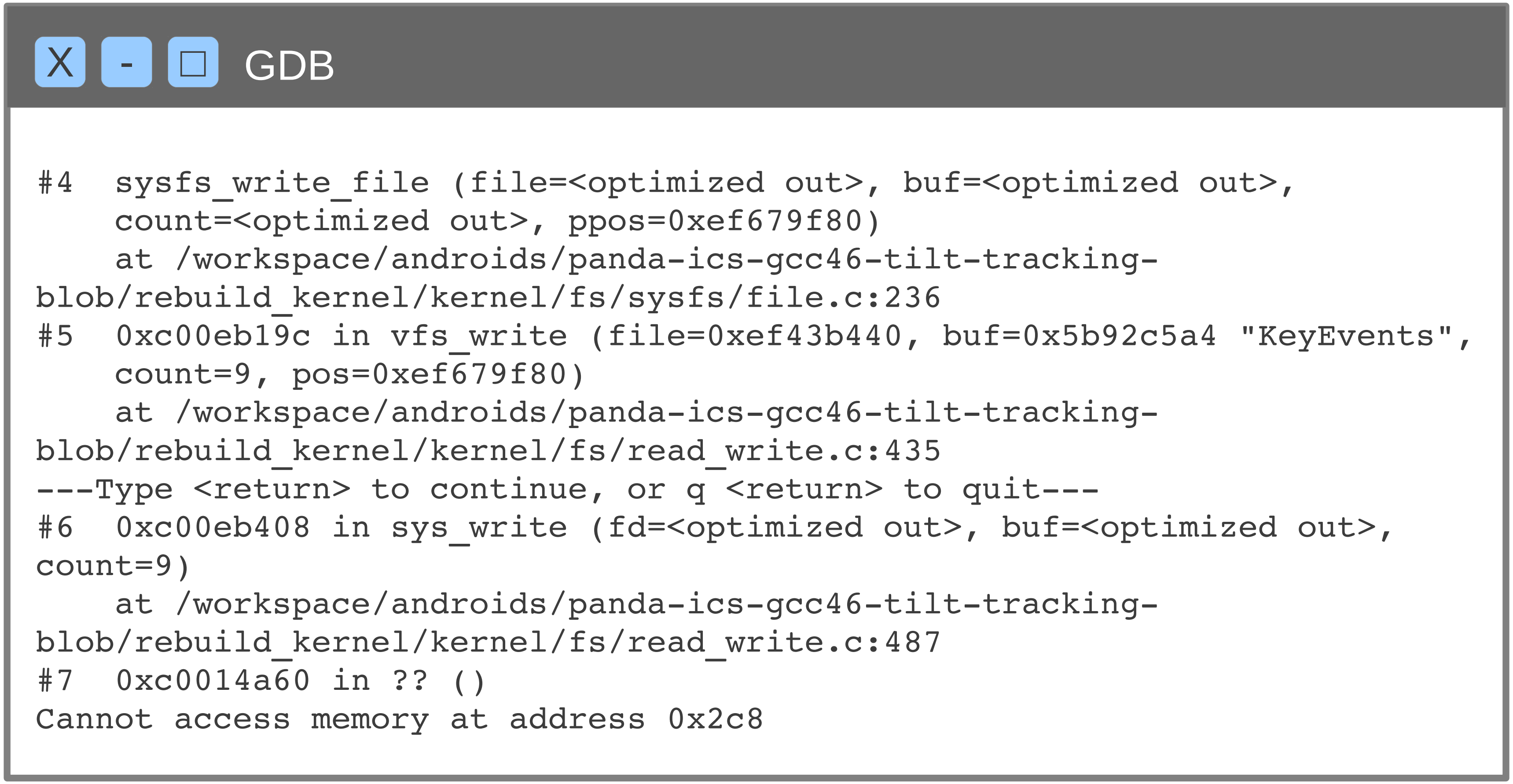
11. Move the mouse a little

Break!



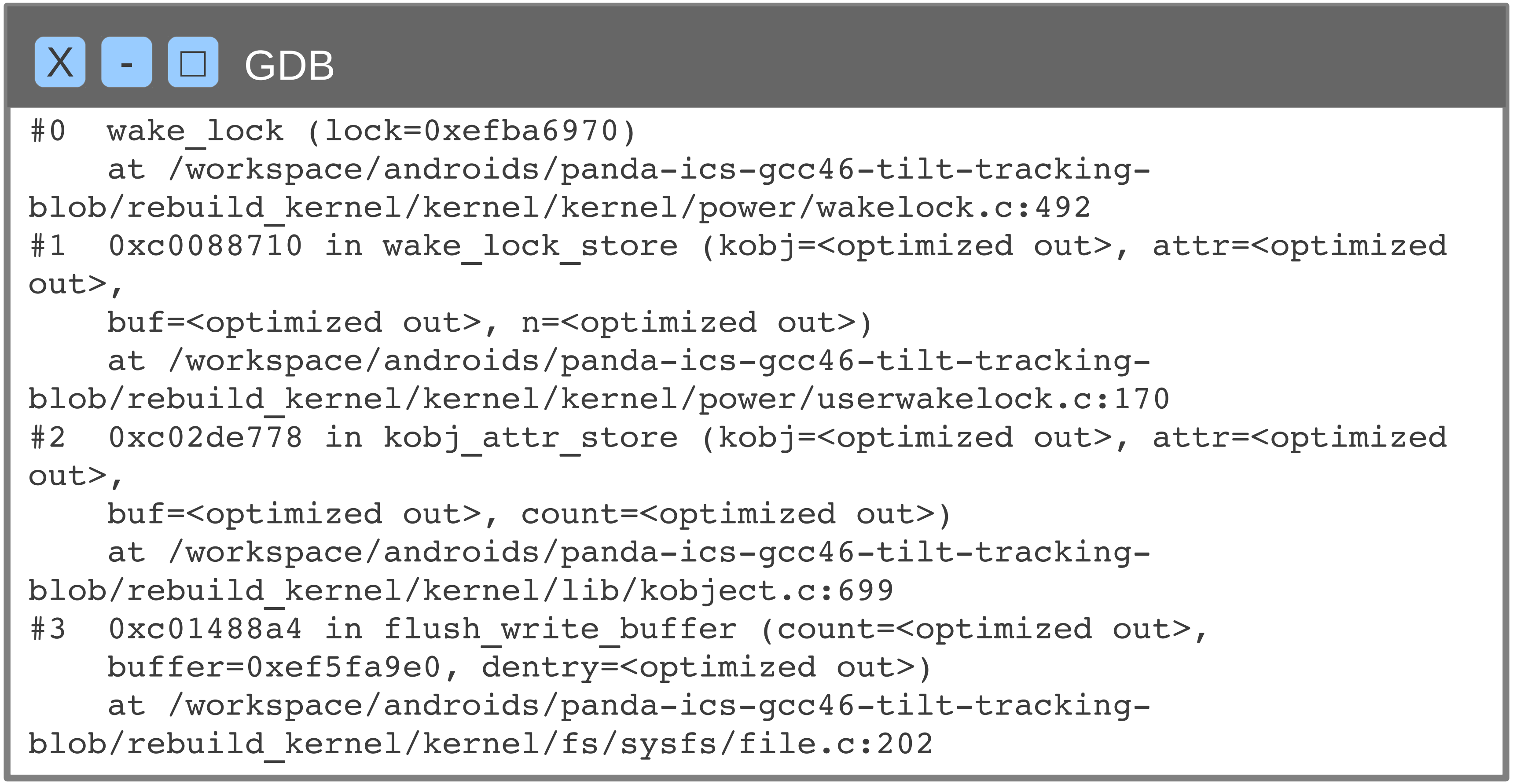
```
Breakpoint 1, wake_lock (lock=0xefad2350)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/power/wakelock.c:492
492		wake_lock_internal(lock, 0, 0);
(gdb) l
487		spin_unlock_irqrestore(&list_lock, irqflags);
488	}
489
490	void wake_lock(struct wake_lock *lock)
491	{
492		wake_lock_internal(lock, 0, 0);
493	}
494	EXPORT_SYMBOL(wake_lock);
495
496	void wake_lock_timeout(struct wake_lock *lock, long
timeout)
```

bt



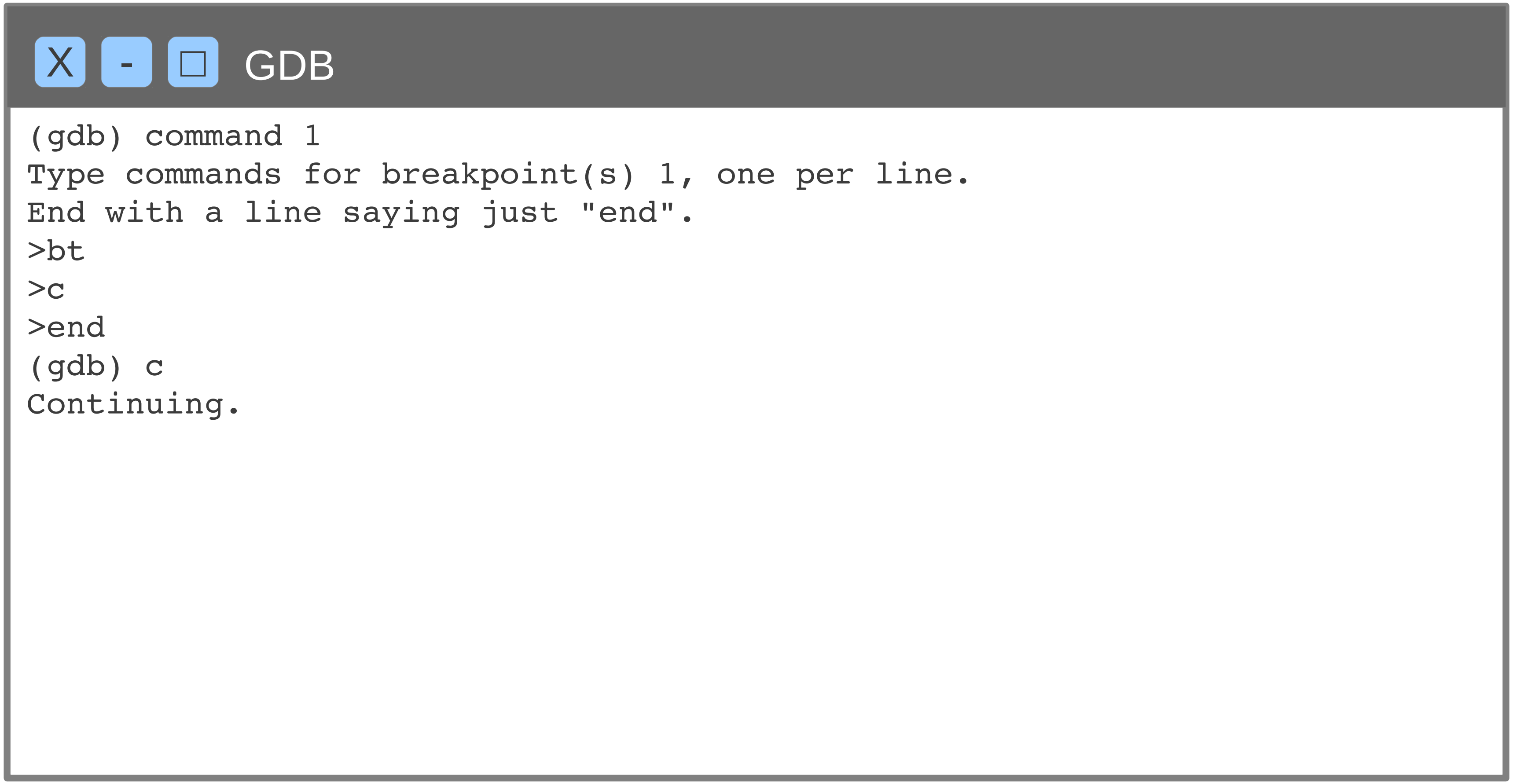
```
#4  sysfs_write_file (file=<optimized out>, buf=<optimized out>,
    count=<optimized out>, ppos=0xef679f80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/sysfs/file.c:236
#5  0xc00eb19c in vfs_write (file=0xef43b440, buf=0x5b92c5a4 "KeyEvents",
    count=9, pos=0xef679f80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:435
---Type <return> to continue, or q <return> to quit---
#6  0xc00eb408 in sys_write (fd=<optimized out>, buf=<optimized out>,
count=9)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:487
#7  0xc0014a60 in ?? ()
Cannot access memory at address 0x2c8
```

bt continued



```
#0  wake_lock (lock=0xefba6970)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/power/wakelock.c:492
#1  0xc0088710 in wake_lock_store (kobj=<optimized out>, attr=<optimized
out>,
    buf=<optimized out>, n=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/power/userwakelock.c:170
#2  0xc02de778 in kobj_attr_store (kobj=<optimized out>, attr=<optimized
out>,
    buf=<optimized out>, count=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/lib/kobject.c:699
#3  0xc01488a4 in flush_write_buffer (count=<optimized out>,
    buffer=0xef5fa9e0, dentry=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/sysfs/file.c:202
```

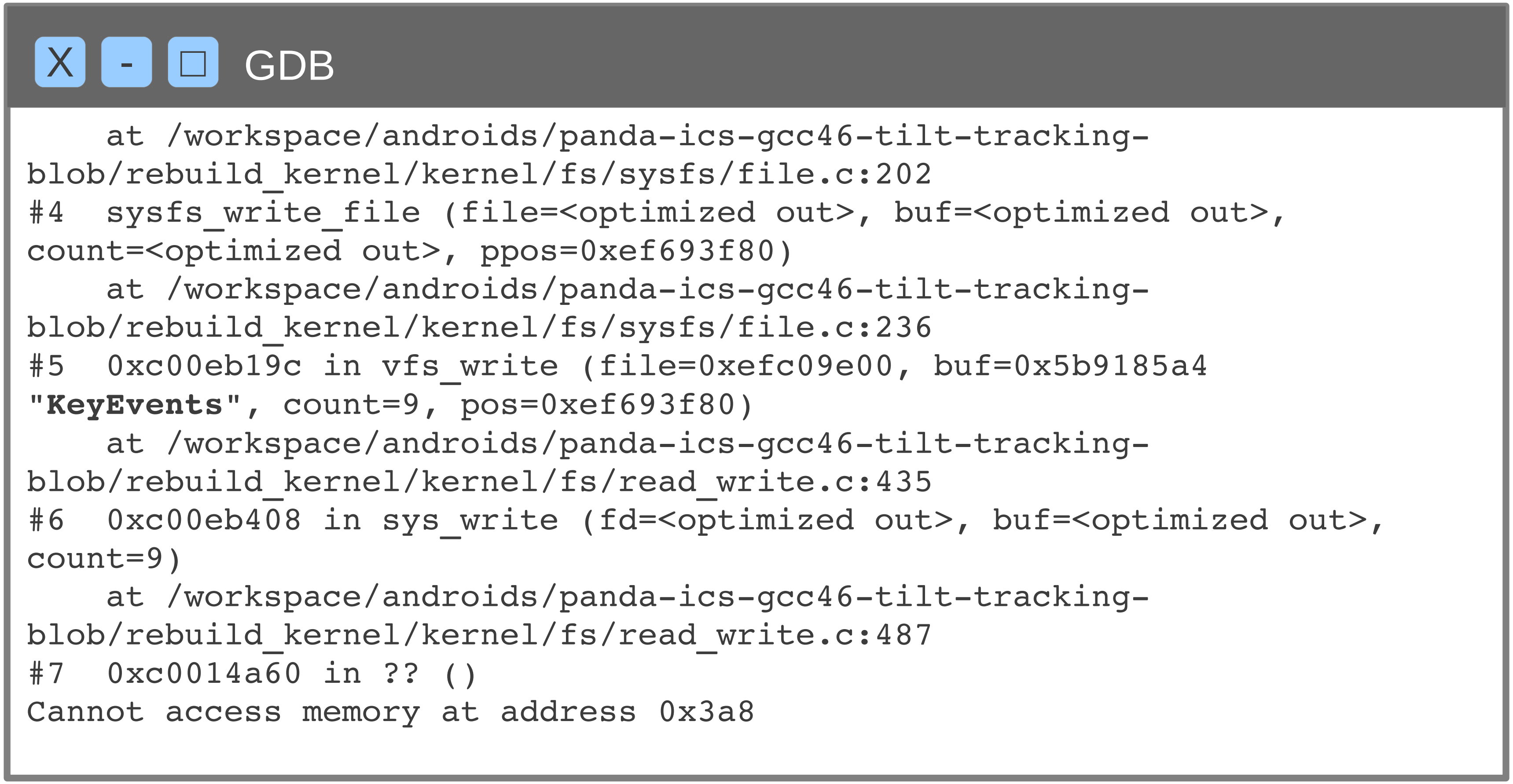
command



```
(gdb) command 1
Type commands for breakpoint(s) 1, one per line.
End with a line saying just "end".
>bt
>c
>end
(gdb) c
Continuing.
```

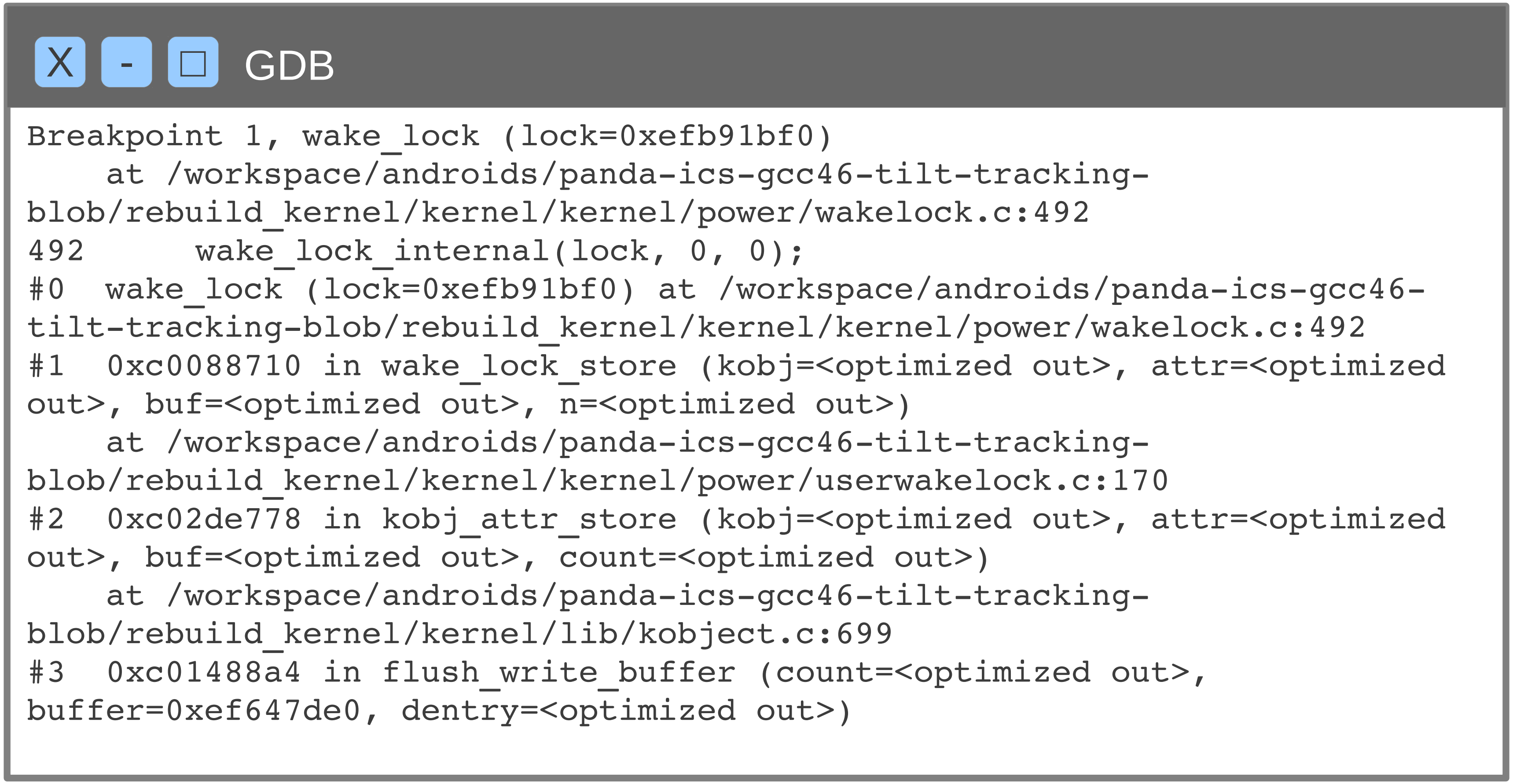
The 1 in 'command 1' specifies which breakpoint

Break after moving mouse



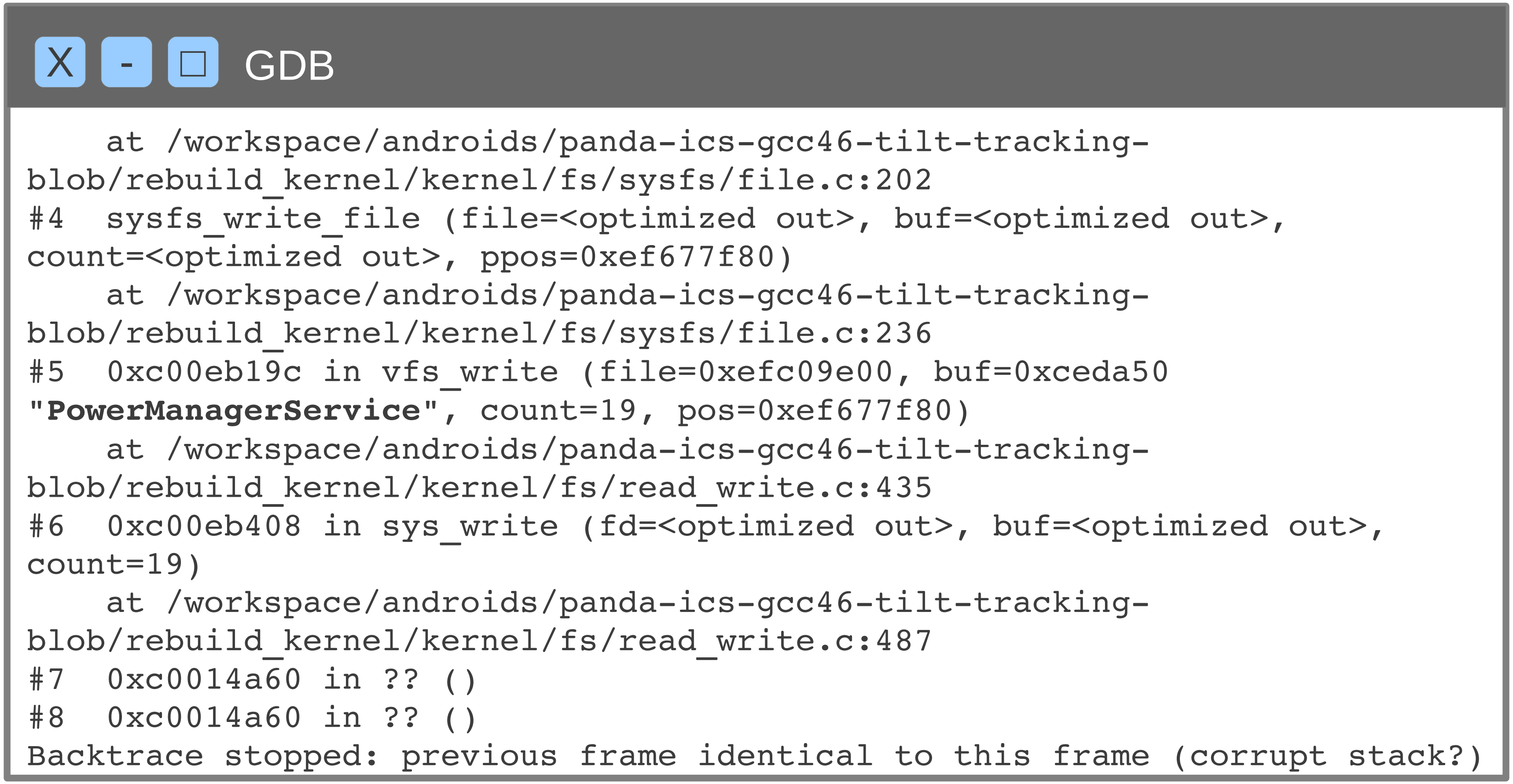
```
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/sysfs/file.c:202
#4  sysfs_write_file (file=<optimized out>, buf=<optimized out>,
count=<optimized out>, ppos=0xef693f80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/sysfs/file.c:236
#5  0xc00eb19c in vfs_write (file=0xefc09e00, buf=0x5b9185a4
"KeyEvents", count=9, pos=0xef693f80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:435
#6  0xc00eb408 in sys_write (fd=<optimized out>, buf=<optimized out>,
count=9)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:487
#7  0xc0014a60 in ?? ()
Cannot access memory at address 0x3a8
```

Break after moving mouse cont...



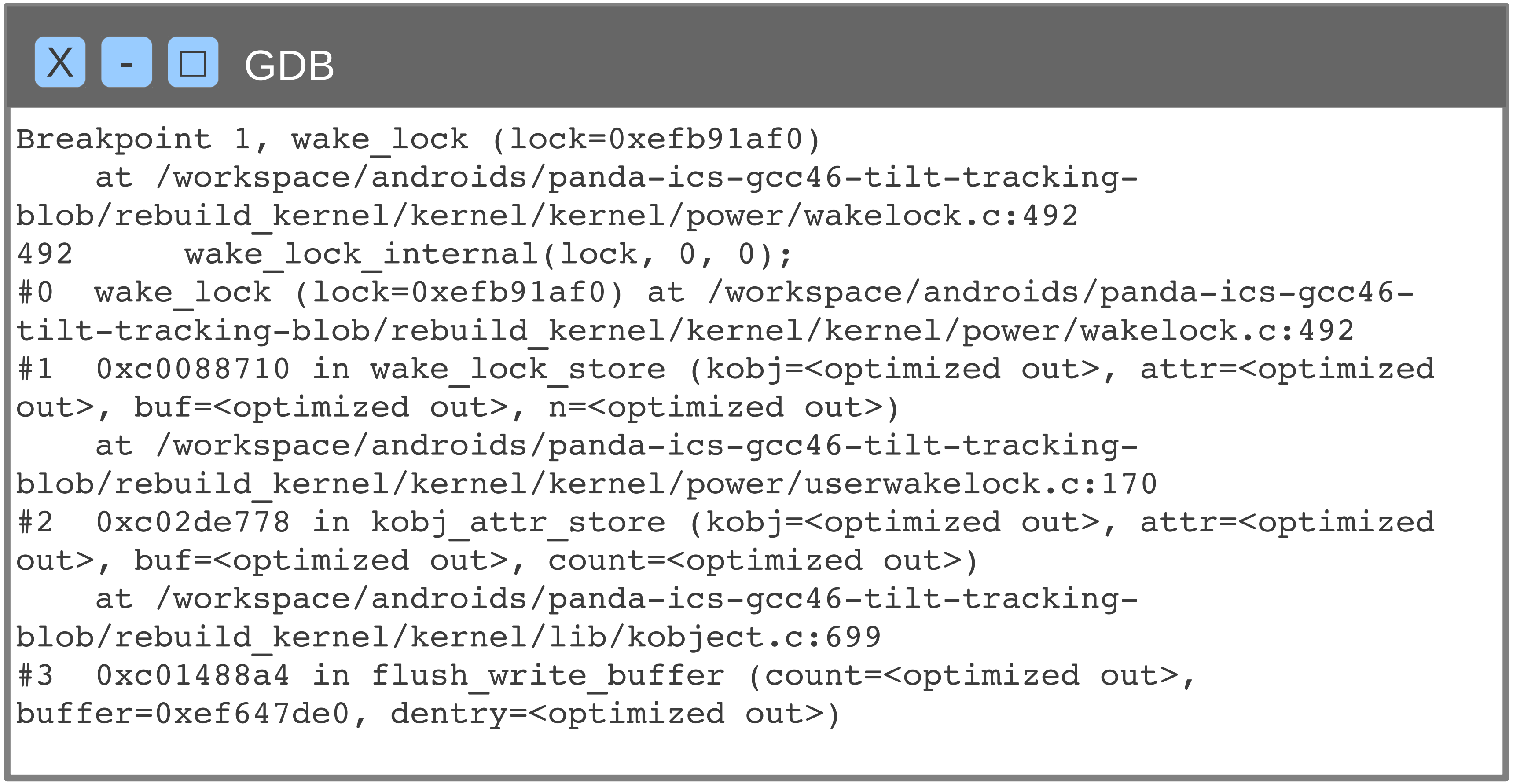
```
Breakpoint 1, wake_lock (lock=0xefb91bf0)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/power/wakelock.c:492
492	        wake_lock_internal(lock, 0, 0);
#0  wake_lock (lock=0xefb91bf0) at /workspace/androids/panda-ics-gcc46-
tilt-tracking-blob/rebuild_kernel/kernel/kernel/power/wakelock.c:492
#1  0xc0088710 in wake_lock_store (kobj=<optimized out>, attr=<optimized
out>, buf=<optimized out>, n=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/power/userwakelock.c:170
#2  0xc02de778 in kobj_attr_store (kobj=<optimized out>, attr=<optimized
out>, buf=<optimized out>, count=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/lib/kobject.c:699
#3  0xc01488a4 in flush_write_buffer (count=<optimized out>,
buffer=0xef647de0, dentry=<optimized out>)
```

Break after PowerManagerService



```
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/sysfs/file.c:202
#4  sysfs_write_file (file=<optimized out>, buf=<optimized out>,
count=<optimized out>, ppos=0xef677f80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/sysfs/file.c:236
#5  0xc00eb19c in vfs_write (file=0xefc09e00, buf=0xceda50
"PowerManagerService", count=19, pos=0xef677f80)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:435
#6  0xc00eb408 in sys_write (fd=<optimized out>, buf=<optimized out>,
count=19)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/fs/read_write.c:487
#7  0xc0014a60 in ?? ()
#8  0xc0014a60 in ?? ()
Backtrace stopped: previous frame identical to this frame (corrupt stack?)
```

Break after PowerManagerService cont...



```
Breakpoint 1, wake_lock (lock=0xefb91af0)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/power/wakelock.c:492
492         wake_lock_internal(lock, 0, 0);
#0  wake_lock (lock=0xefb91af0) at /workspace/androids/panda-ics-gcc46-
tilt-tracking-blob/rebuild_kernel/kernel/kernel/power/wakelock.c:492
#1  0xc0088710 in wake_lock_store (kobj=<optimized out>, attr=<optimized
out>, buf=<optimized out>, n=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/kernel/power/userwakelock.c:170
#2  0xc02de778 in kobj_attr_store (kobj=<optimized out>, attr=<optimized
out>, buf=<optimized out>, count=<optimized out>)
    at /workspace/androids/panda-ics-gcc46-tilt-tracking-
blob/rebuild_kernel/kernel/lib/kobject.c:699
#3  0xc01488a4 in flush_write_buffer (count=<optimized out>,
buffer=0xef647de0, dentry=<optimized out>)
```

Is the PowerManagerService the thing that puts me to sleep?

Debugging the Kernel and User Space at the Same Time

- A Quick Introduction to Linaro
- Using Linaro's Android Platform
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  - Build and Use the Platform from Source
  - Debug with GDB
  - Debugging the Kernel
    - Rebuild the Kernel
      - < android-build Build Naming
    - Change the Kernel's Config
  - **Debugging the Kernel and User Space at the Same Time**
  - Native Debugging with ARM's DS-5 Community Edition
- G1 Bring Up

Dual Debug

General Sequence: Part 1

1. Start up kernel debug
2. Break kernel
3. Set kernel breakpoint
4. Continue in kernel GDB

General Sequence: Part 2

5. Start up user debug
6. Set user space breakpoint
7. Continue in user space
8. Trigger condition and watch!

General Sequence: Part 1

1. Start up kernel debug
2. Break kernel
3. Set kernel breakpoint
4. Continue in kernel GDB

```
gdb-multiarch ../rebuild_kernel/out/vmlinux

(gdb) set remotebaud 115200

(gdb) target remote /dev/ttyUSB0

adb shell echo g > /proc/sysrq-trigger

(gdb) b some_symbol

(gdb) c
```

This is the order of commands. Ones without (gdb) should be typed into shells.

General Sequence: Part 2

5. Start up user debug
6. Set user space breakpoint
7. Continue in user space
8. Trigger condition and watch!

```
adb forward tcp:5039 tcp:5039

adb shell gdbserver :5039 --attach 1451

gdb-multiarch --tui /path/to/binary

(gdb) symbol-file path/to/binary/symbols

(gdb) set solib-search-path top/path/of/lib

(gdb) target remote :5039
```

This is the order of commands. Ones without (gdb) should be typed into shells.

Native Debugging with ARM's DS-5 Community Edition

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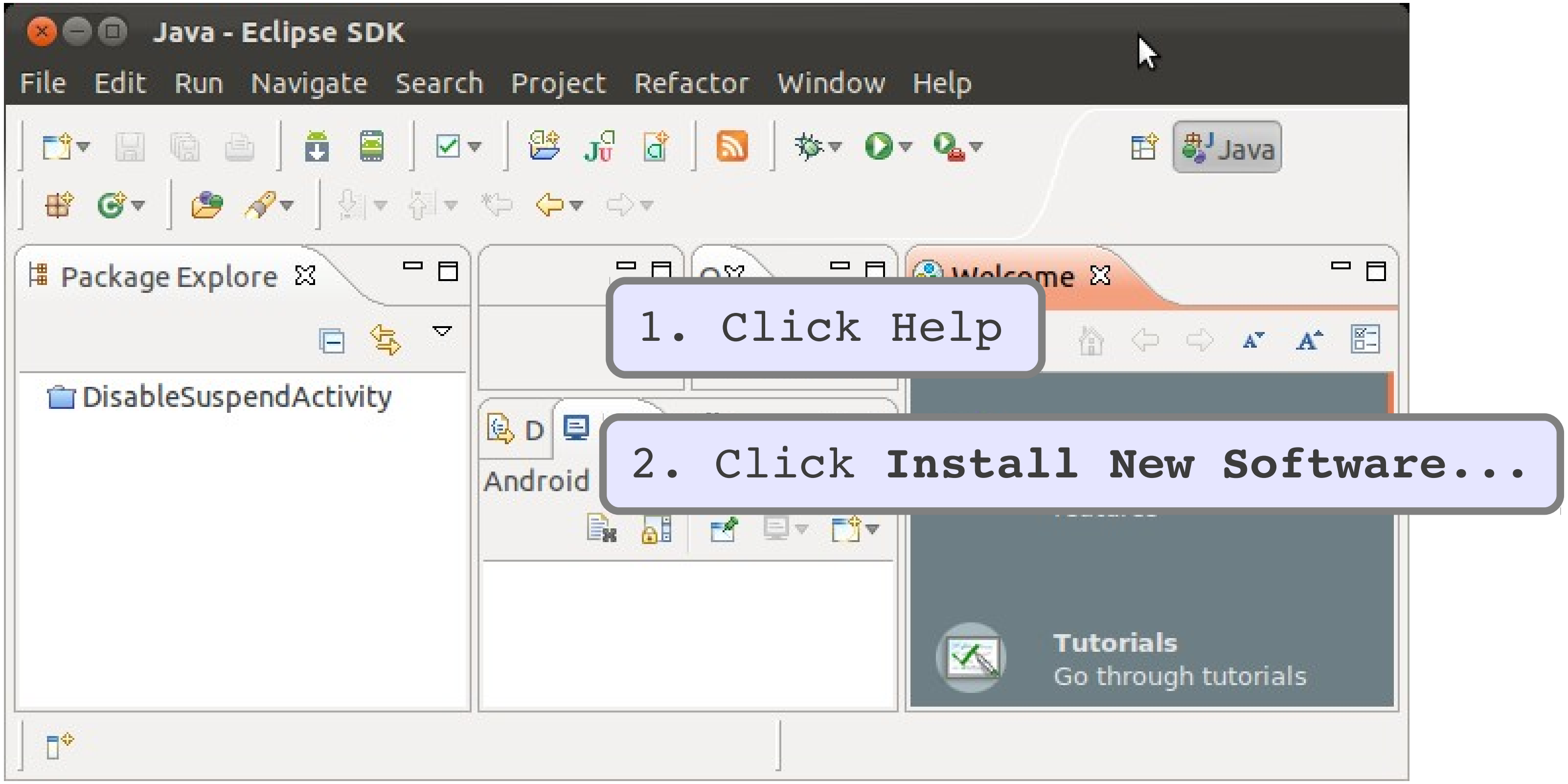
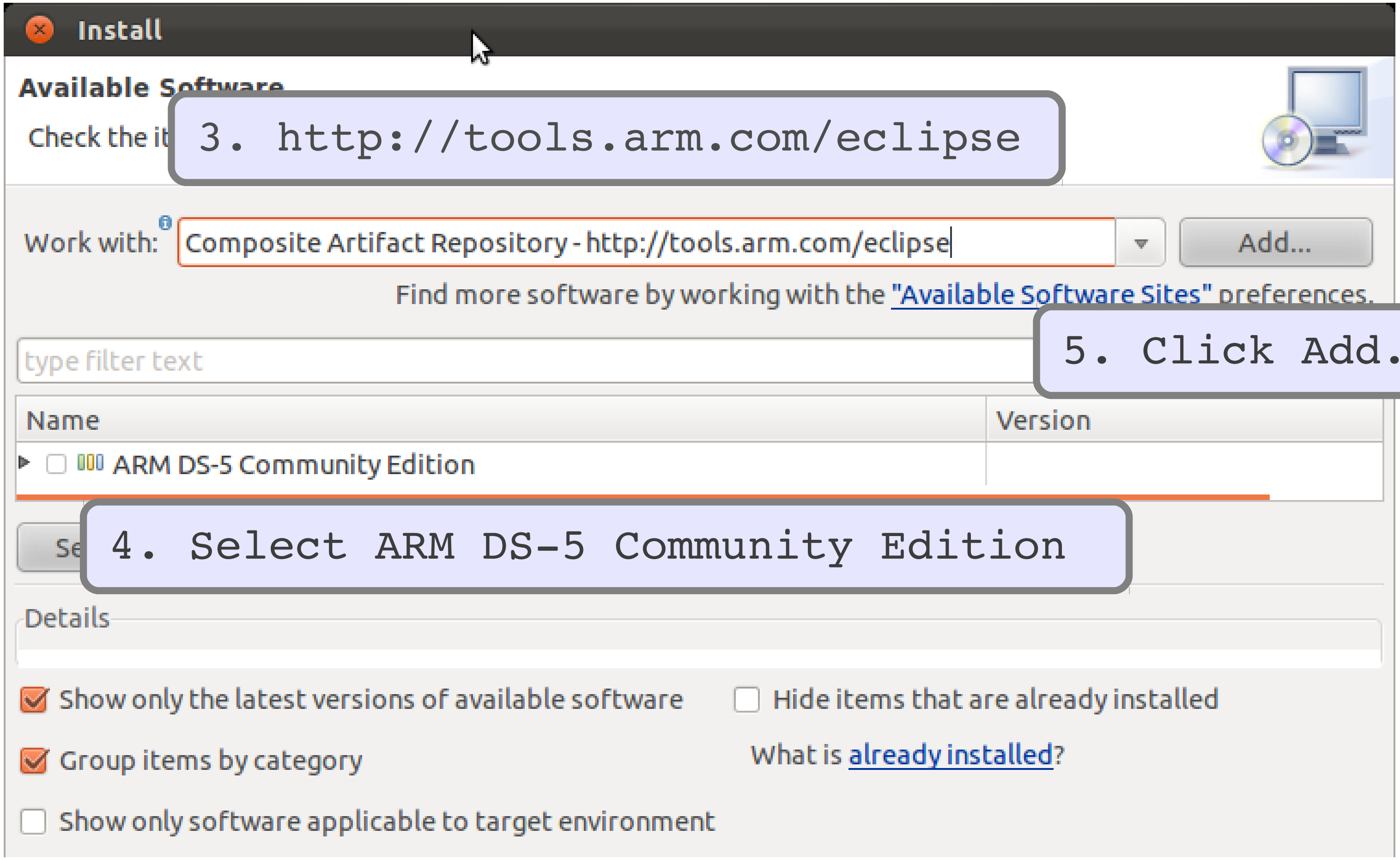
Install



1. Click Help

2. Click **Install New Software...**

Install



Install

Available Software

Check the it

3. http://tools.arm.com/eclipse

Work with: Composite Artifact Repository - http://tools.arm.com/eclipse

Find more software by working with the "Available Software Sites" preferences.

5. Click Add...

type filter text

Name	Version
□ ARM DS-5 Community Edition	

4. Select ARM DS-5 Community Edition

Details

☑ Show only the latest versions of available software

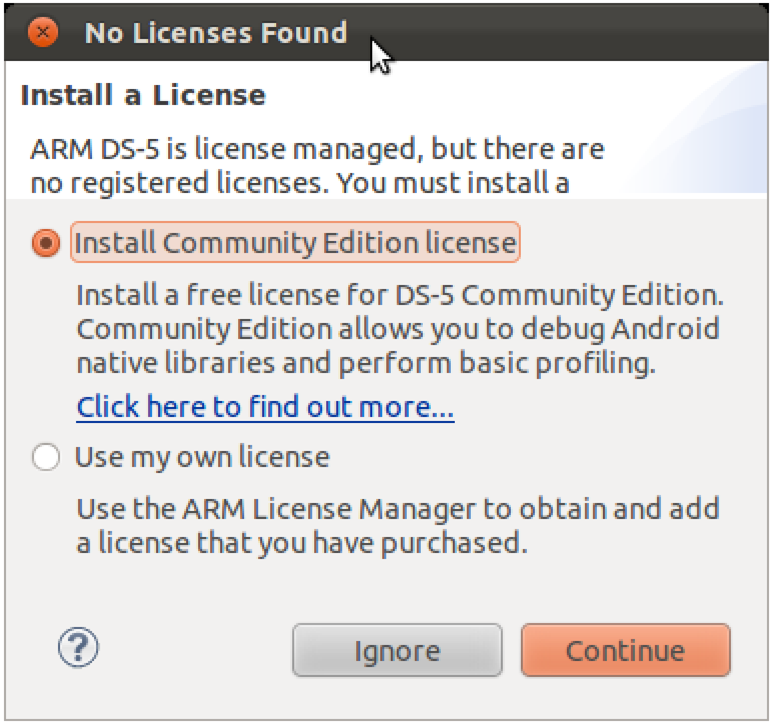
□ Hide items that are already installed

☑ Group items by category

What is already installed?

□ Show only software applicable to target environment

Install



No Licenses Found

Install a License

ARM DS-5 is license managed, but there are no registered licenses. You must install a

● Install Community Edition license

Install a free license for DS-5 Community Edition. Community Edition allows you to debug Android native libraries and perform basic profiling.

Click here to find out more...

○ Use my own license

Use the ARM License Manager to obtain and add a license that you have purchased.

6. Accept License

Debugging Linaro with DS-5

```
The DS-5 defaults need to be modified to work
with Linaro builds.
```

Linaro Mods

1. Reinstall App mod

2. Built-in gdbserver mod part 1

3. Built-in gdbserver mod part 2

4. Built-in gdbserver mod part 3

Linaro Mods

1. Reinstall App mod

Preinstalled apps must be re-installed to be debugged

```
<eclipse>/plugins/<version>/Boards/Android/Generic
/adb_common.py

Line 395:

cmd = adb + ' install -r ' + '"' +
os.path.join(apk_path, apk_name) + '"'
```

Linaro Mods

2. Built-in gdbserver mod part 1

Use the preinstalled gdbserver

```
<eclipse>/plugins/<version>/Boards/Android/Generic/adb_common.py

Line 635: (and 626)

cmd = adb + ' shell ' + path + '/system/bin/gdbserver' + ' :' + port + ' --attach ' + pid
```

Linaro Mods

3. Built-in gdbserver mod part 2

Use the preinstalled gdbserver

<eclipse>/plugins/<version>/Boards/Android/Generic/adb_common.py

Comment out lines 630 to 635 from adb_common.py to allow the built-in gdbserver to be used.

Linaro Mods

4. Built-in gdbserver mod part 3

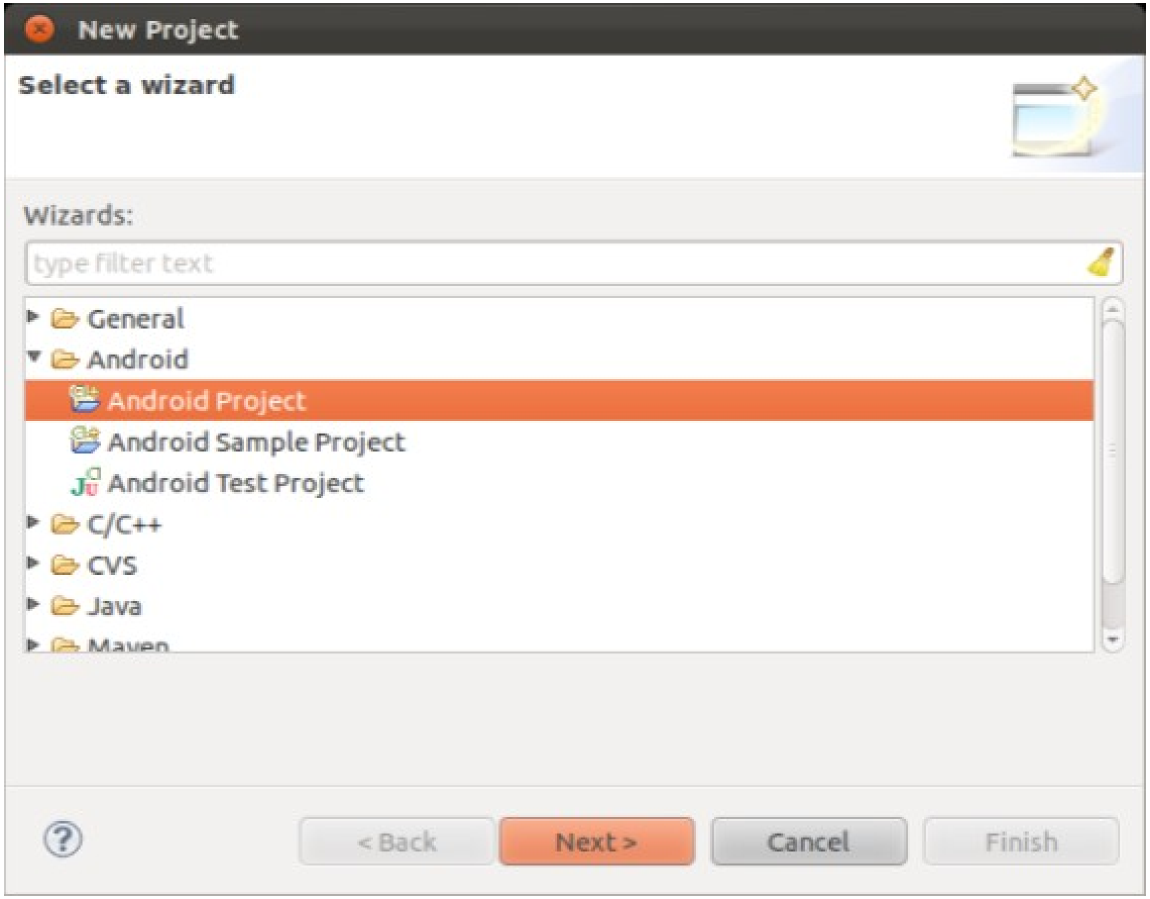
Steers DS-5 to use the builtin gdbserver

<eclipse>/plugins/<version>/Boards/Android/Generic/run.py

Force root = true on line 40

Create Project

```
File > New Project > Android project
```



New Project

Select a wizard

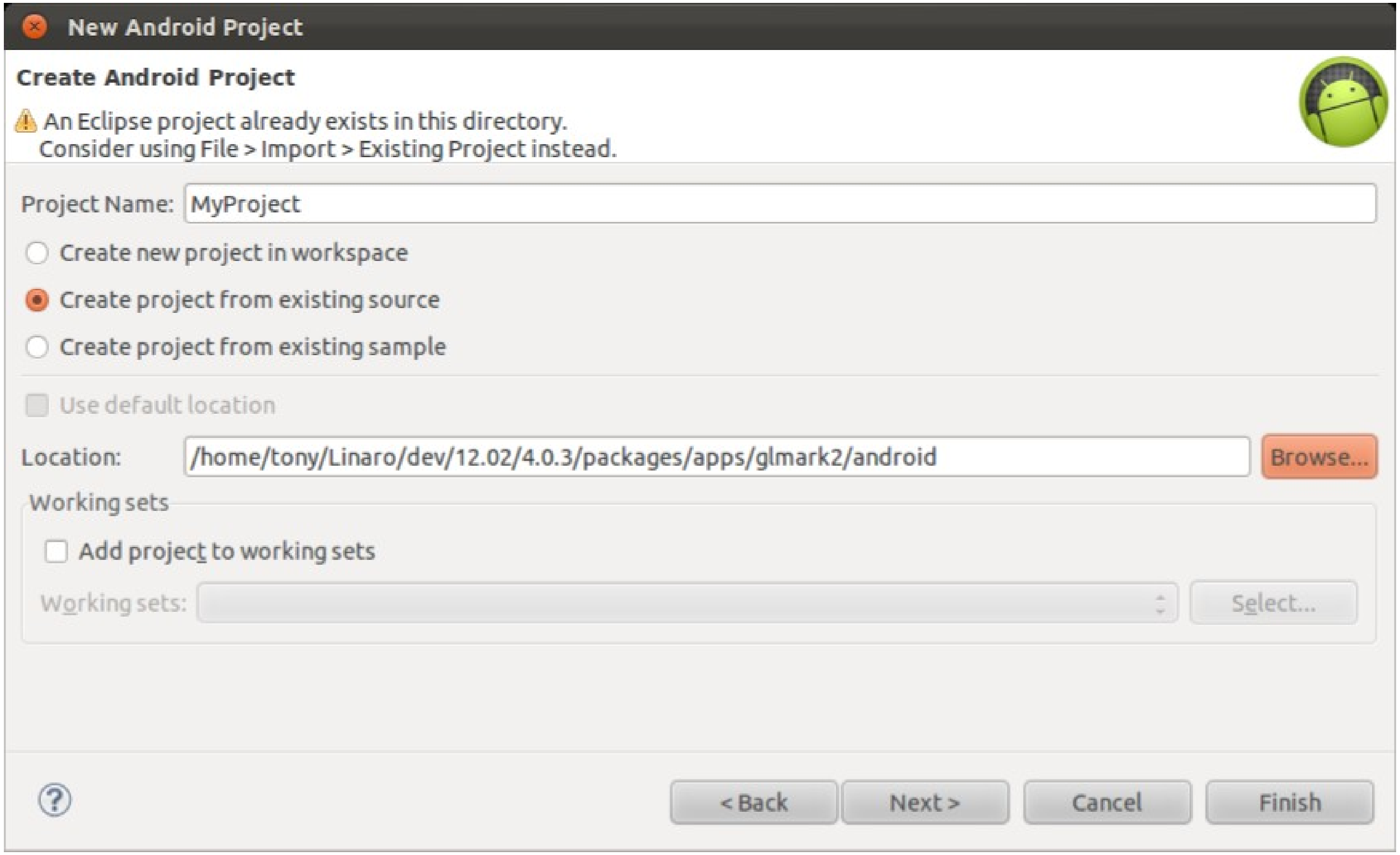
Wizards:

type filter text

- General
- Android
  - Android Project
  - Android Sample Project
  - Android Test Project
- C/C++
- CVS
- Java
- Maven

< Back | Next > | Cancel | Finish

From Existing Source



New Android Project

Create Android Project

⚠ An Eclipse project already exists in this directory.
Consider using File > Import > Existing Project instead.

Project Name: MyProject

○ Create new project in workspace

● Create project from existing source

○ Create project from existing sample

☐ Use default location

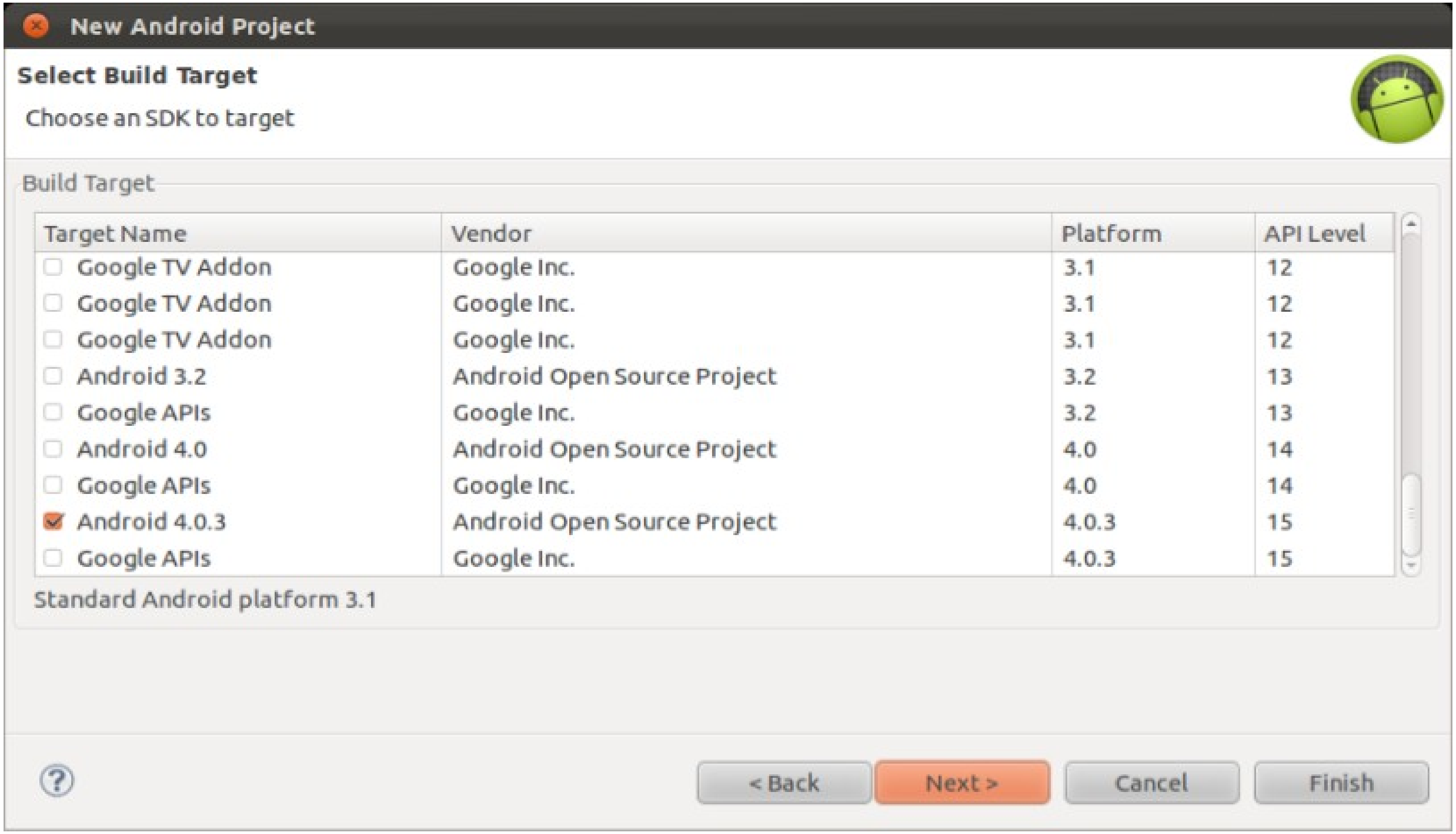
Location: /home/tony/Linaro/dev/12.02/4.0.3/packages/apps/glmark2/android

Working sets

☐ Add project to working sets

Working sets:

Select API Level



Select Build Target

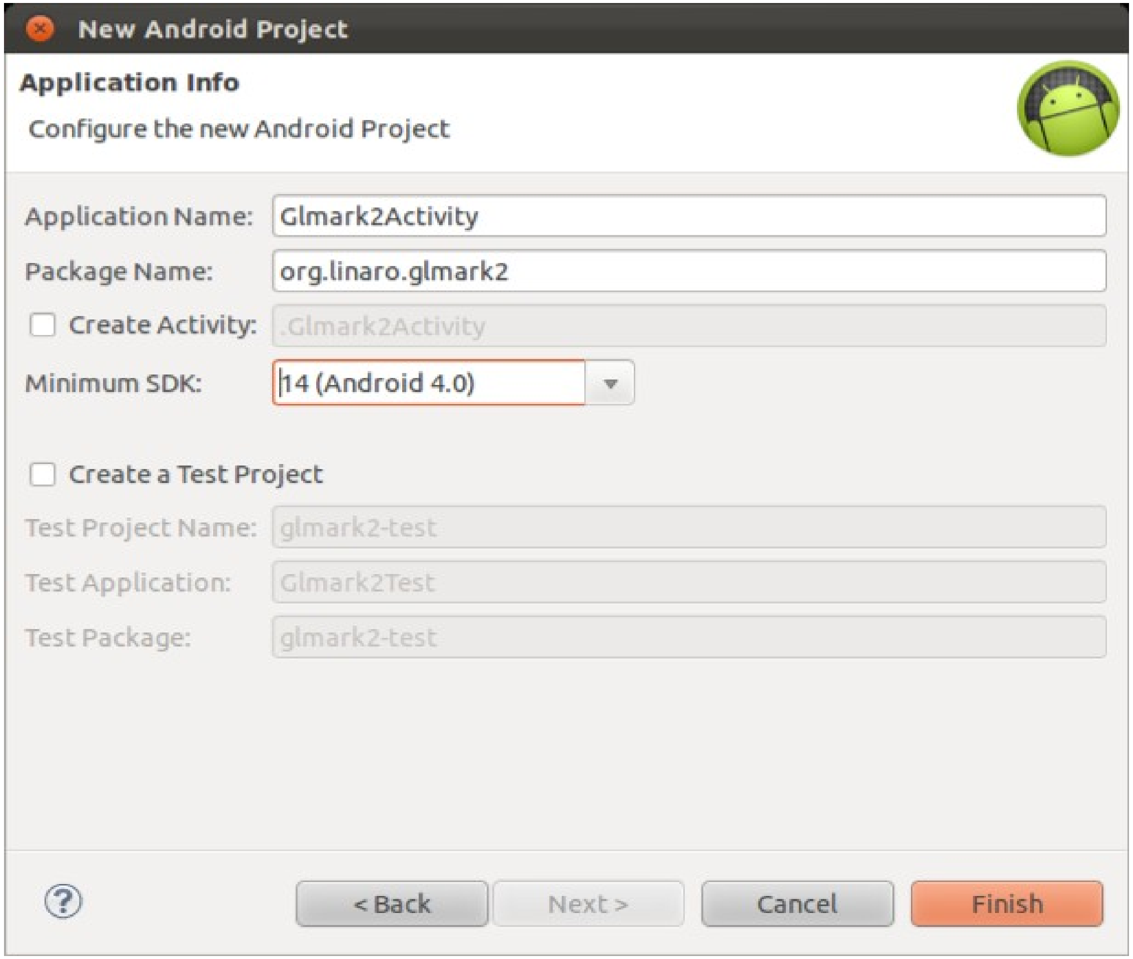
Choose an SDK to target

Build Target

Target Name	Vendor	Platform	API Level
□ Google TV Addon	Google Inc.	3.1	12
□ Google TV Addon	Google Inc.	3.1	12
□ Google TV Addon	Google Inc.	3.1	12
□ Android 3.2	Android Open Source Project	3.2	13
□ Google APIs	Google Inc.	3.2	13
□ Android 4.0	Android Open Source Project	4.0	14
□ Google APIs	Google Inc.	4.0	14
☑ Android 4.0.3	Android Open Source Project	4.0.3	15
□ Google APIs	Google Inc.	4.0.3	15

Standard Android platform 3.1

Select Package and App Name



Application Info

Configure the new Android Project

Application Name: Glmark2Activity

Package Name: org.linaro.glmark2

☐ Create Activity: .Glmark2Activity

Minimum SDK: 14 (Android 4.0)

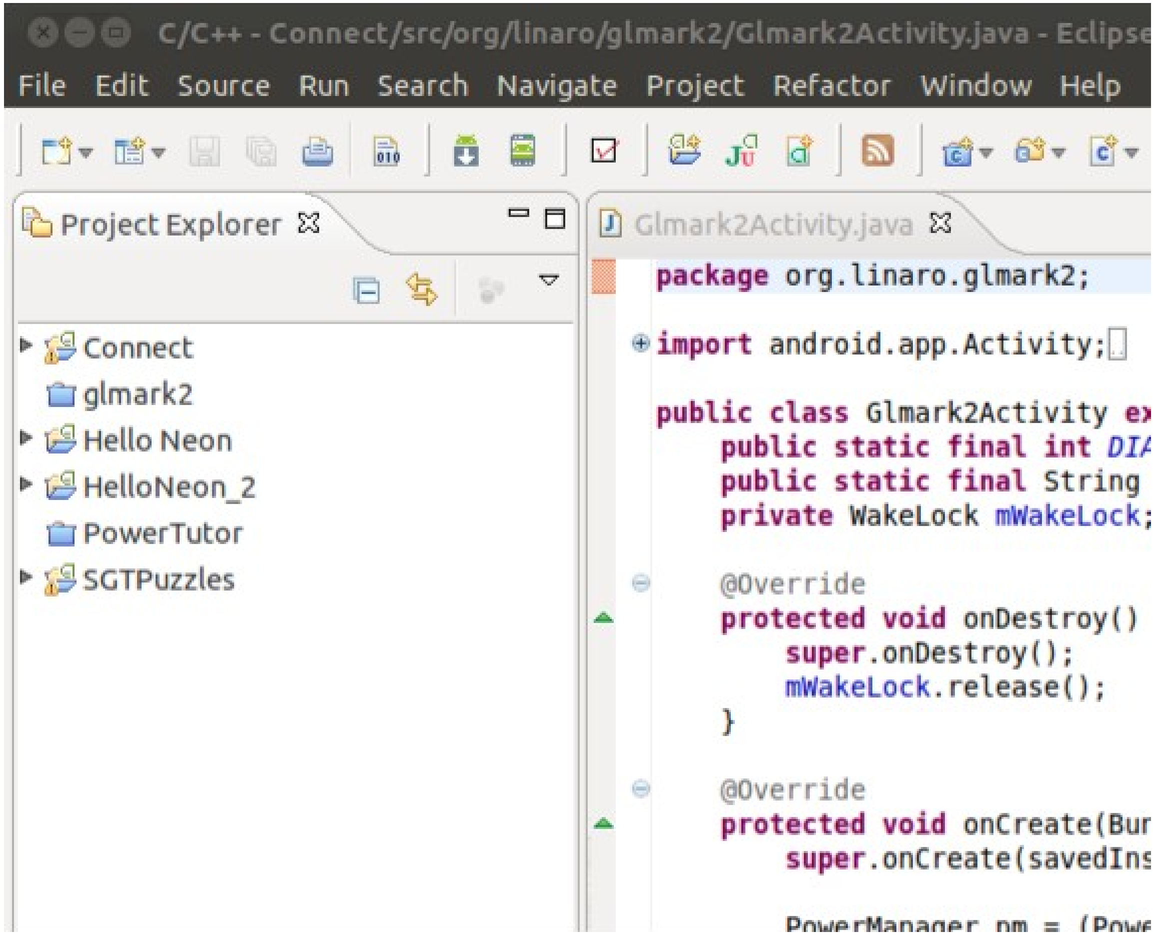
☐ Create a Test Project

Test Project Name: glmark2-test

Test Application: Glmark2Test

Test Package: glmark2-test

Happy SDK Debugging



```
package org.linaro.glmark2;

import android.app.Activity;

public class Glmark2Activity ex
    public static final int DIA
    public static final String
    private WakeLock mWakeLock;

    @Override
    protected void onDestroy()
        super.onDestroy();
        mWakeLock.release();
    }

    @Override
    protected void onCreate(Bur
        super.onCreate(savedIns

        PowerManager pm = (Powe
```

G1 Bring Up

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QuIC's Reference Code

```
git clone https://www.codeaurora.org/gitweb/quic/la//kernel/msm.git

cd msm

git checkout remotes/origin/android-msm-2.6.29-donut

ls arch/arm/mach-msm/
```

Many, many files

Google's Code

```
git clone https://www.codeaurora.org/gitweb/quic/la//kernel/msm.git

cd msm

git checkout  remotes/origin/aosp/android-msm-2.6.29-donut

ls arch/arm/mach-msm/
```

Stripped down set of files

Brought up each Kernel/Modem Interface

1. Proc Comm - proc_comm.c

2. Shared Memory Driver - smd.c

3. RPC Router - smd_rpcrouter.c

Proc Comm Bring Up

```
Boot up, modem hung, kernel hung
```

```
Kernel hung on proc_comm_wait_for()
```

```
Issue: race between kernel and modem
```

SMD Bring Up

Boot up, no serial output

SMD buffer full

Issue: incorrect assumption about shared memory region layout on modem and kernel side

RPC Bring Up

Boot up, random reboots

System is under load

Issue: kernel doesn't respond to a modem watchdog

Thanks!

IRC, email or our awesome Linaro Platform Team with any questions..